9 JUNE 1955 ONE SHILLING

ELECTRICAL TIMES

Littlebrook Power Stations A, B and C

Over 163 miles of Henley cables have been installed by Henley's Contract Department for the C.E.A. South Eastern Division at the three Power Stations at Littlebrook, [illegible] Dartford, Kent. These cover a range of voltages up to 132kV.

Consulting Engineers: Messrs. Merz and [illegible]

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There can only be one winner in any field . . .

and Benjamin are way out in front when it comes to fluorescent fittings. The design and construction of our famous 'Crysteel' and 'Peropal' Flurolier fittings are backed by years of experience and research in this very specialised field. For efficient power factor correction, minimum stroboscopic effect and lower initial cost, Benjamin Twin Lamp Circuits are recommended. Whatever *your* lighting problems consult Benjamin—first!

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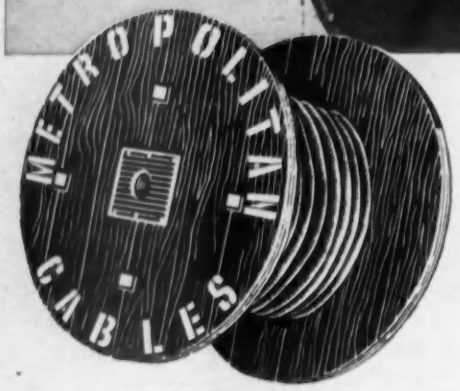

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WIRED THROUGHOUT WITH METROPOLITAN SHIPWIRING CABLE

Our picture shows H.M.S. Wexham, an Inshore Minesweeper, shortly after her launching at the yards of Messrs. James Taylor (Chertsey) Limited. This fine ship, 106 ft. in length and driven by Paxman Diesel Engines, is wired throughout with Metropolitan Shipwiring Cables.

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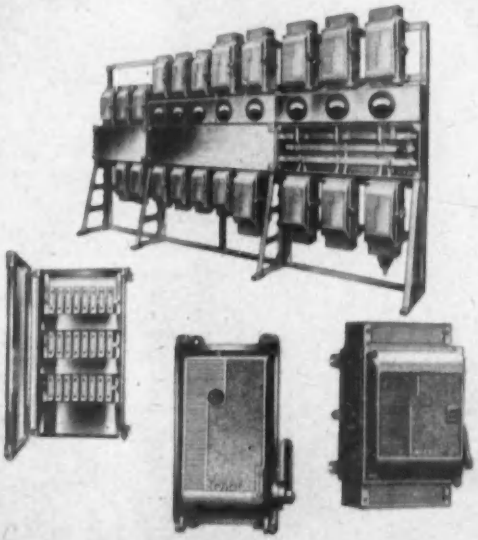

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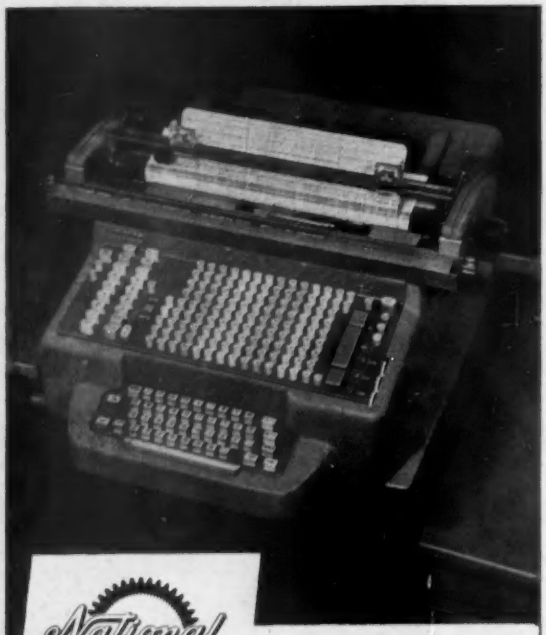

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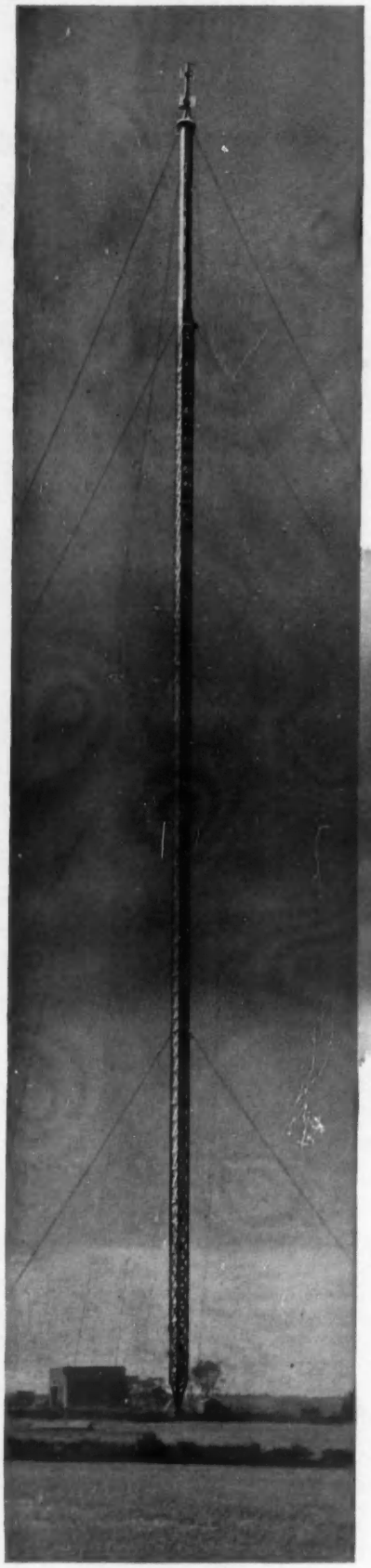

Corrosive, sulphur-laden smog from Birmingham's industrial areas rises into the warmer air above the City. Prevailing winds bear it steadily away to the North-North-East. In its path, at Sutton Coldfield, stands the B.B.C. television transmitting mast, rising to 750 feet.

Here, six miles from the centre of the City, the corrosive properties of the smog have become concentrated into a moving stratum 200 feet in depth—*which attacks the galvanised steelwork of the mast at approximately the 200/500ft. level.*

The BICC Group who designed and erected the mast, maintain fully equipped corrosion laboratories to deal with such atmospheric corrosion problems; and when the corrosive effects of this atmospheric phenomenon were first reported, they were asked to find a remedy.

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'DANGER' SMOG AT WORK!

This is typical of the work being carried out by the BICC Corrosion Research Organization who are continually finding new ways of ensuring longer life for BICC products.

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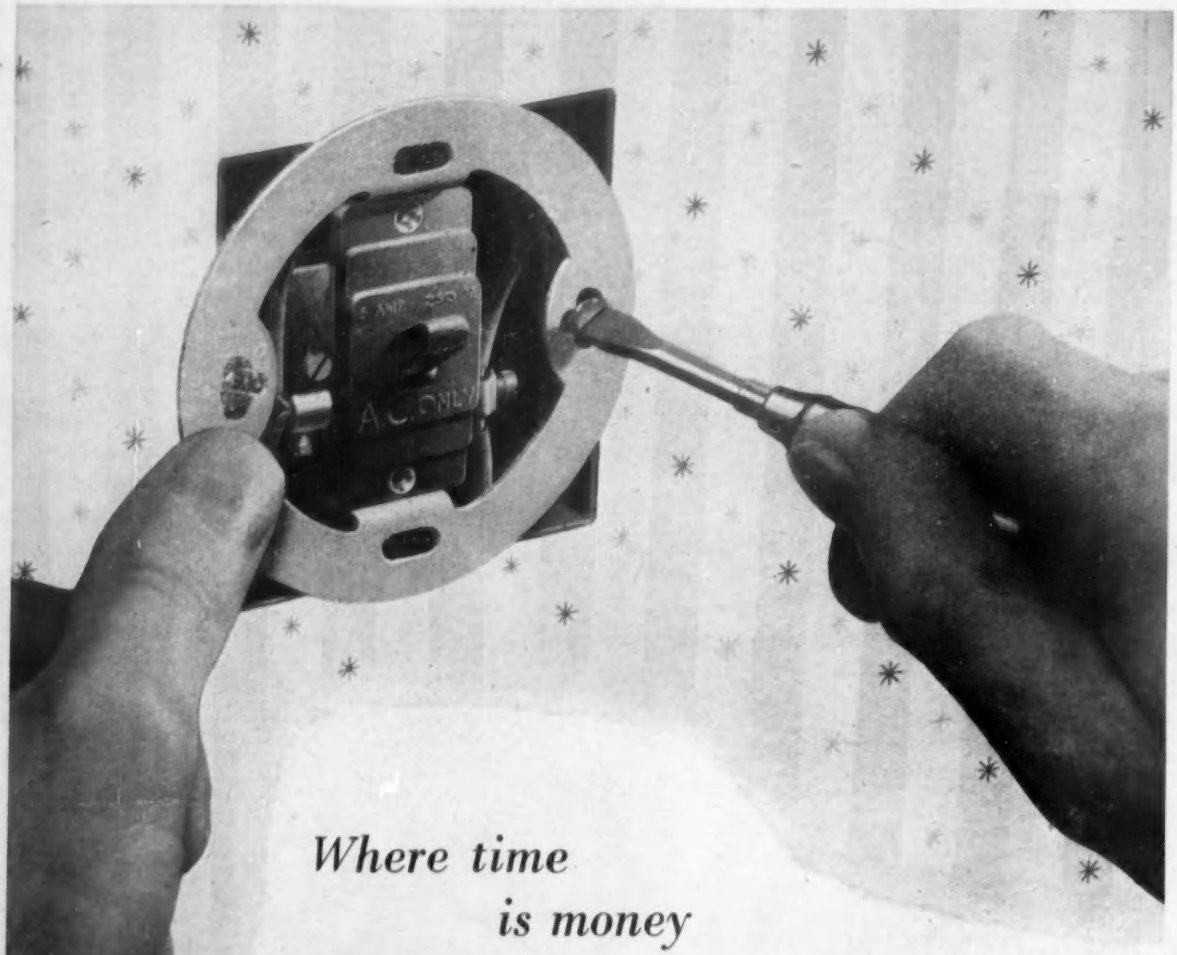
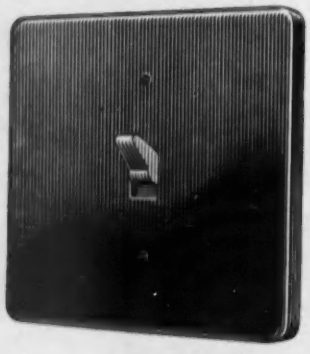


Where time is money

Falks 'Realflush' switches with the grid feature cut fixing time in half with a corresponding saving in man hours on the pay-roll.



THE 'REALFLUSH' SWITCH

This original and immensely popular switch is designed to keep installation cost at an absolute minimum as well as giving a pleasing appearance with every decorative scheme.

With B.S.1299 centres and alternative wood screw fixing holes, it is suitable for true plaster depth or deeper fixings. Steel or wood boxes are available. The 2-gang version in the normal sized box gives sensible cable accommodation.

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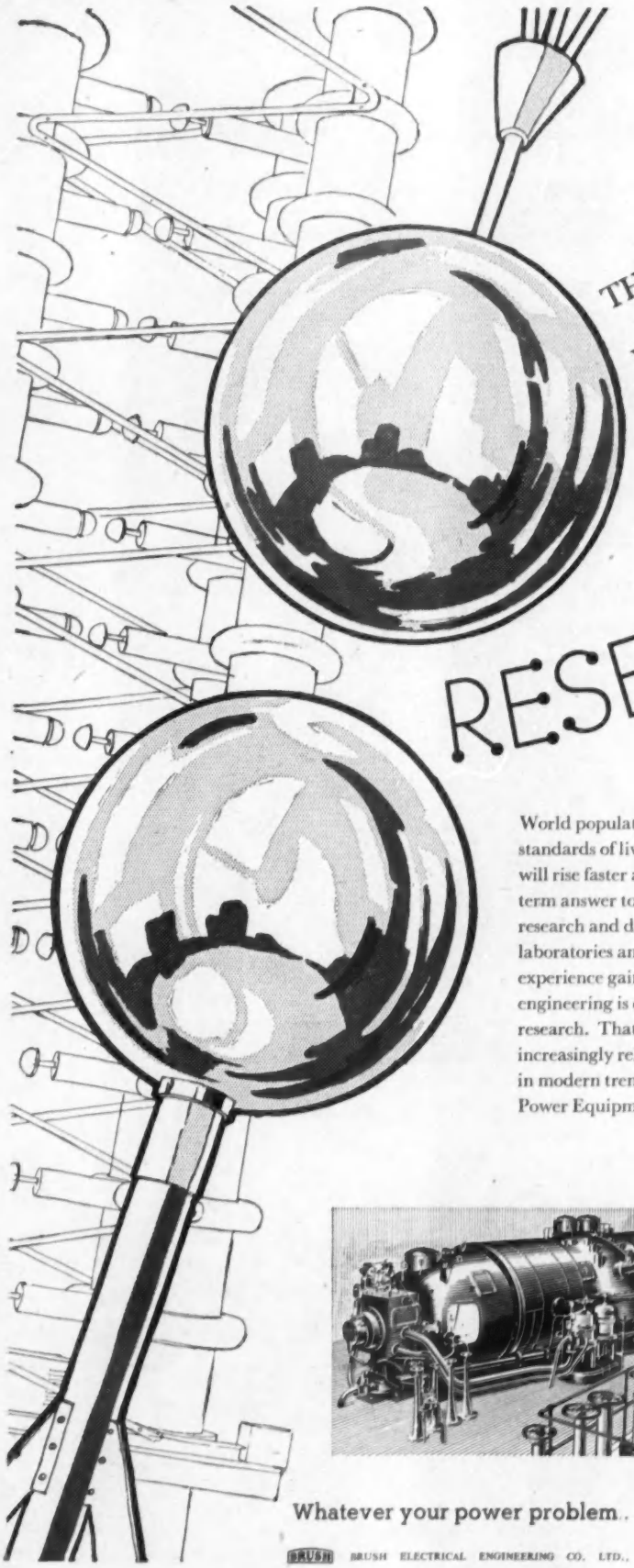

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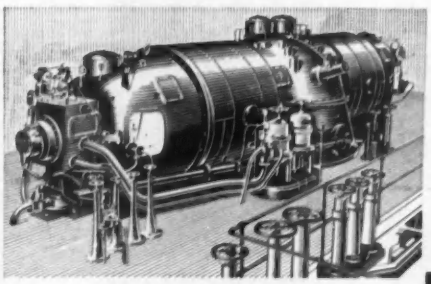
World population is increasing at the same time as standards of living. This means that power demands will rise faster and faster. The only long-term answer to this problem is a vigorous policy of research and development. In the Brush Electrical laboratories and experimental bays the accumulated experience gained in over 70 years of creative engineering is constantly being concentrated on practical research. That is why, all over the world, Power Engineers increasingly rely on Brush to provide leadership in modern trends in the design and construction of Power Equipment.



A 'Brush' Ljungstrom Turbo-alternator Set—12,500 kW installed at Hunts Bay Power Station, Jamaica.

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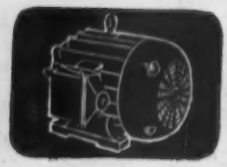

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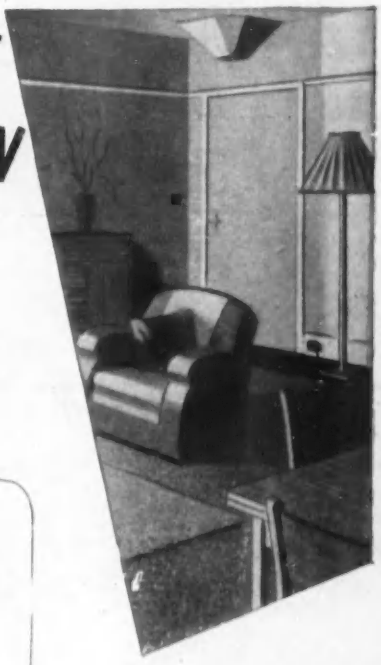

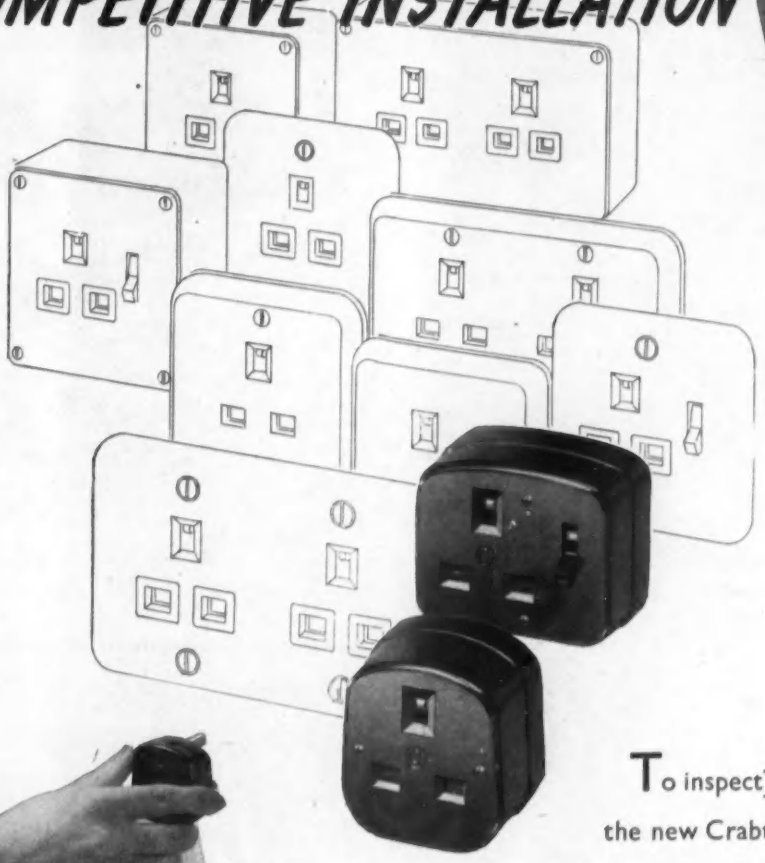

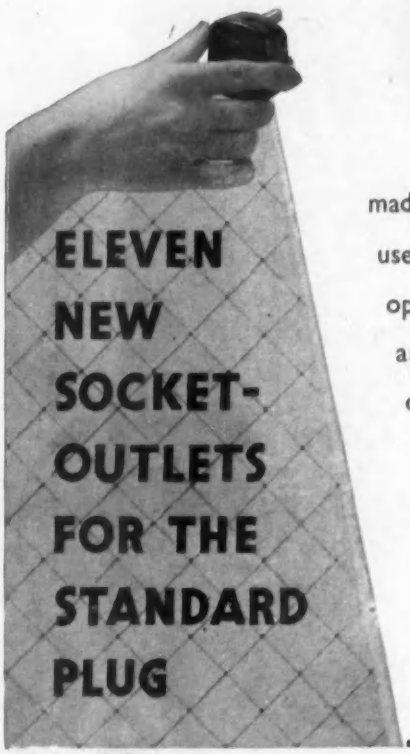

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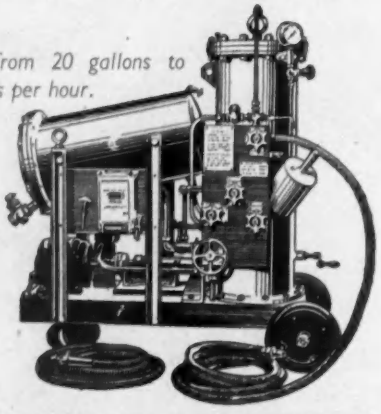

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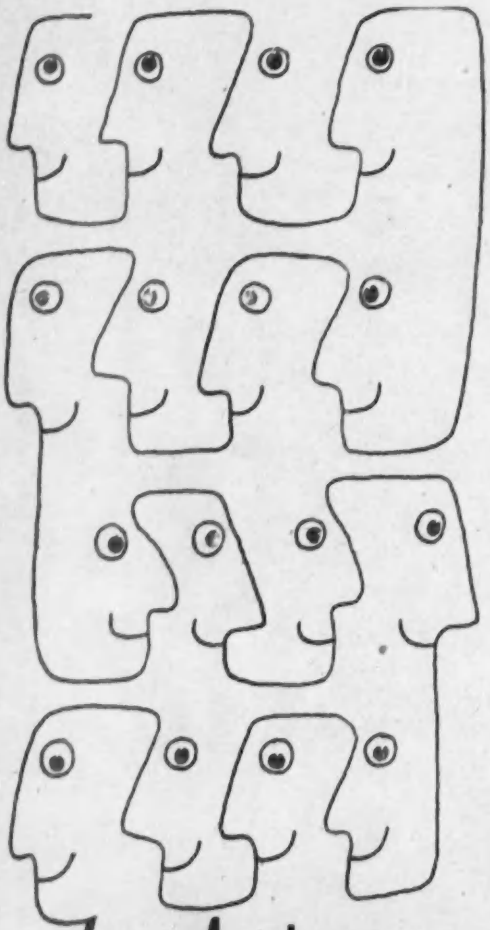

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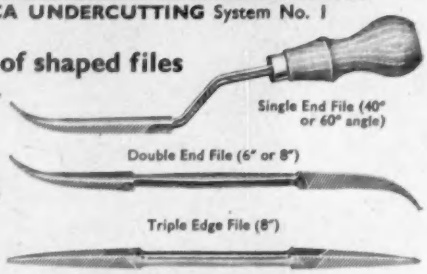
MICA UNDERCUTTING System No. 1

By the use of shaped files used either



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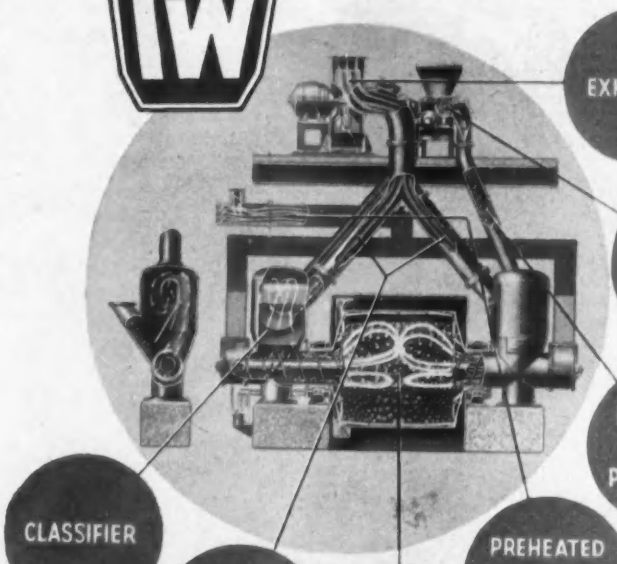

Cutaway drawing of Foster Wheeler Ball Mill Pulverizer with single exhauster and single feeder. Systems also available with two exhausters and two feeders; and for pressurized operation.

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This is the SWITCH
that is welcomed by the wireman for its practical solution to the problems of installation.

This is the SWITCH
It is appearing on more and more specifications.
Its name is the **PLATESWITCH**

This striking new design fits into plaster-depth boxes and is available up to three gangs. The range is described in full in MK leaflet 233.

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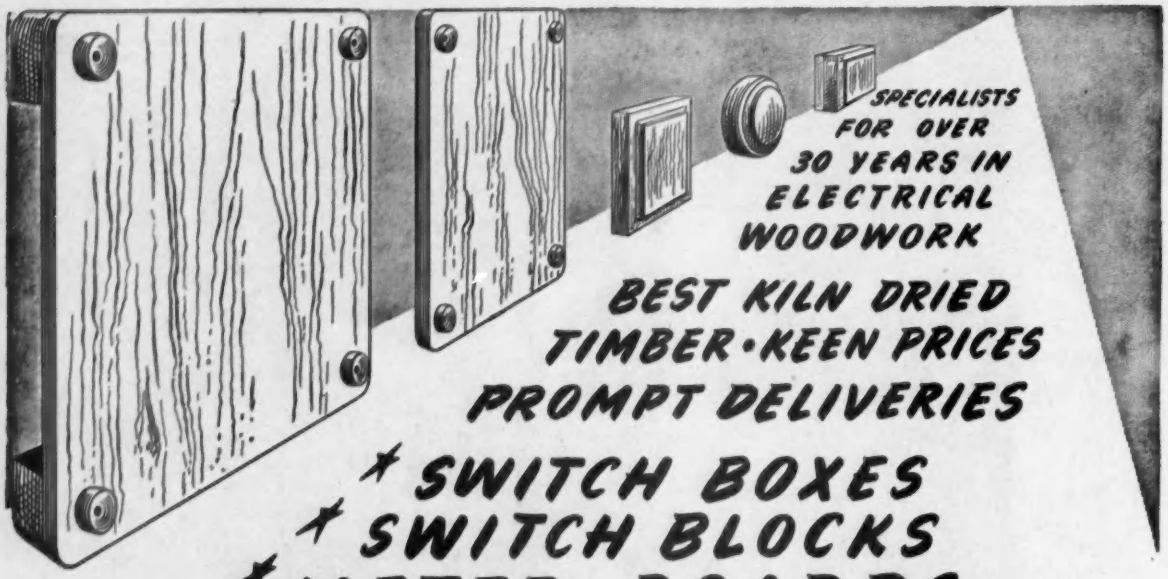

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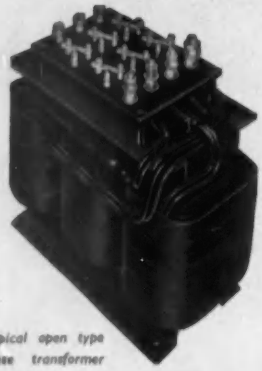

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From 8VA to 100kVA

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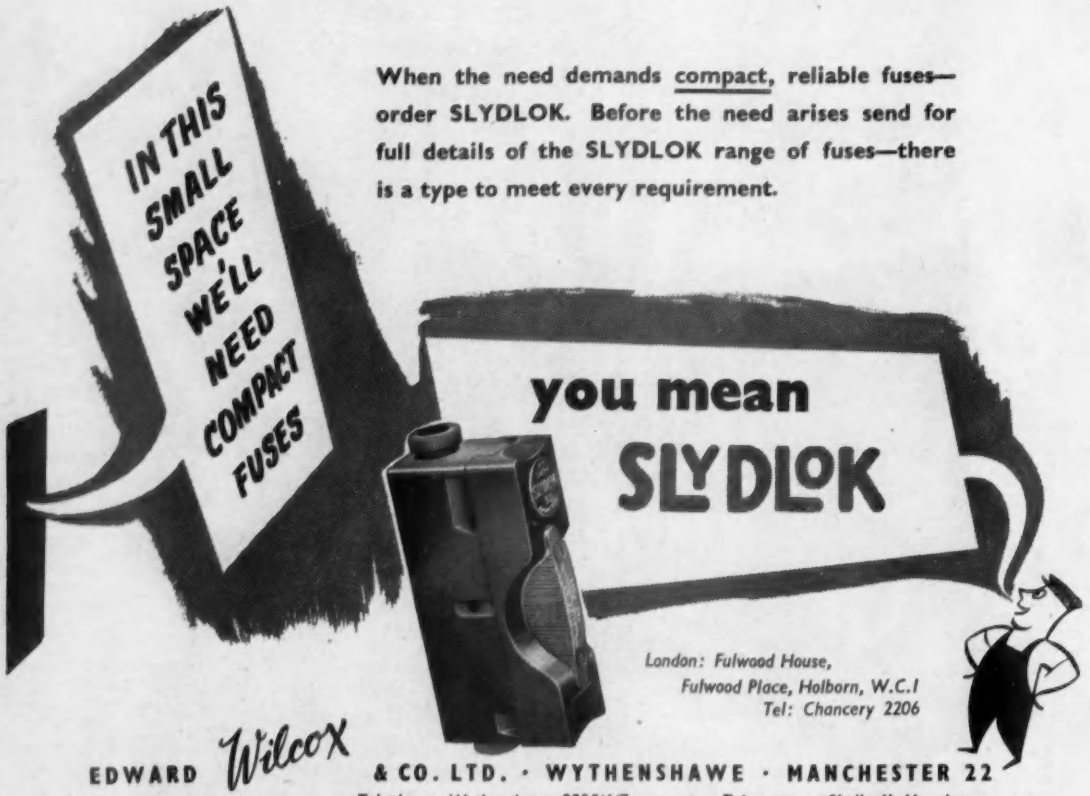

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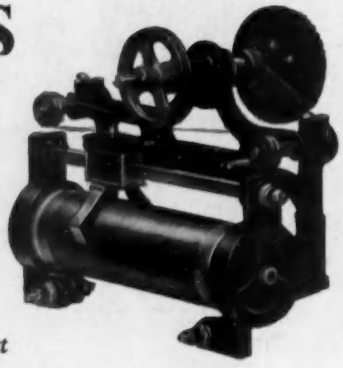

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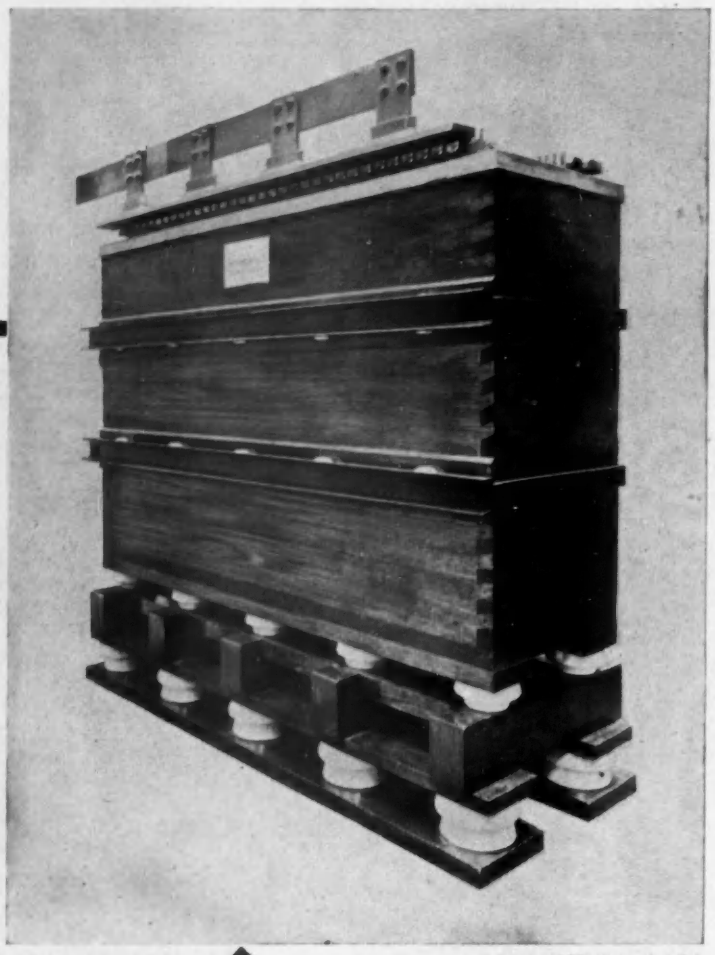

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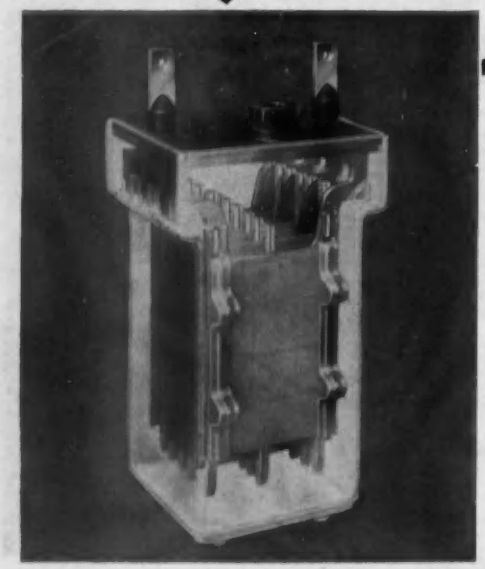

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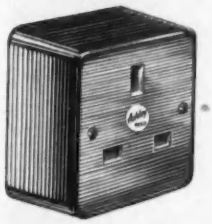

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SK 15 Brown
SK 16 Cream
2 5/16" sq. x 1 3/8" body proj.
Four fixing holes 1 9/16" centres. Four knockouts.

FLUSH
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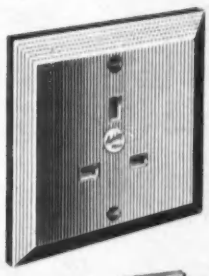
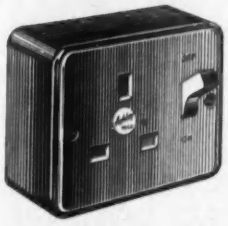
SK 14 Cream
3 5/16" sq. x 7/16" plate proj. Base proj. 3/4" x 1 13/16" x 1 9/16". Two fixing holes 2 3/8" centres.



SOCKET-OUTLETS *(above)*. Safety shutters operated initially by plug earth pin acting on brass insert. Self-aligning socket-contacts, integral with terminals taking up to three 7/.029 cables.



SURFACE
SS 15 Brown
SS 16 Cream
3 1/4" length x 2 7/16" width x 1 3/8" body proj. Two fixing holes 3" centres. Four knockouts.

FLUSH
SS 13 Brown
SS 14 Cream
3 5/16" sq. x 7/16" plate proj. Base proj. 3/4" x 2" sq. Two fixing holes 2 3/8" centres.

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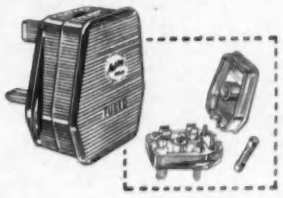

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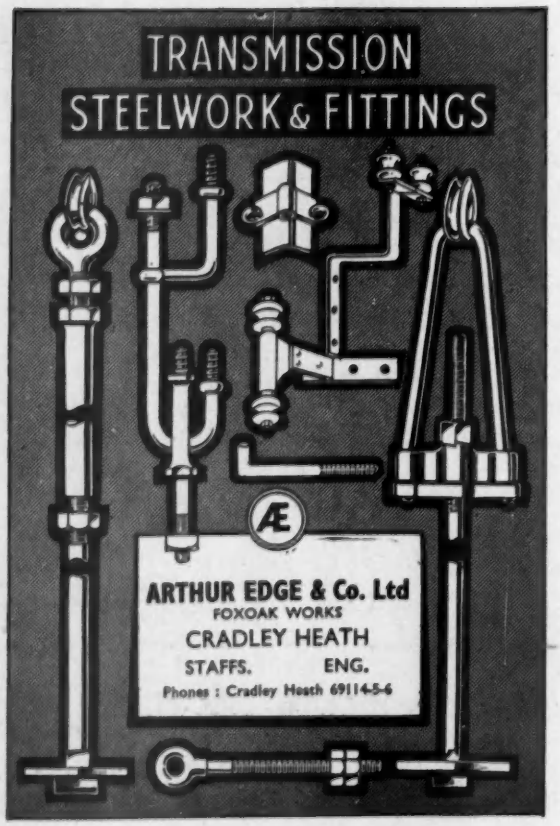

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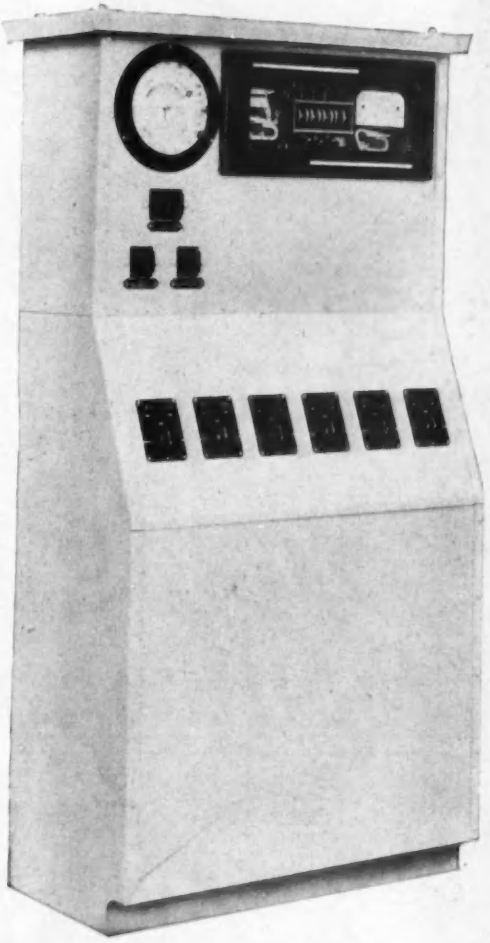

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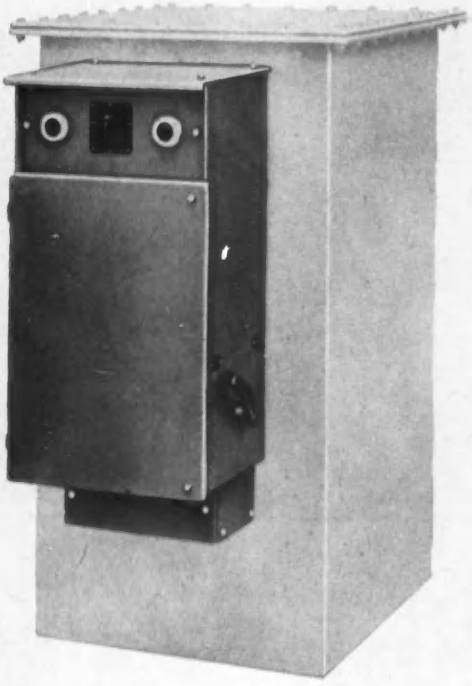

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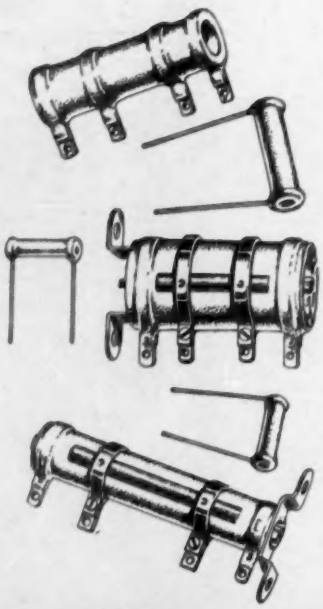

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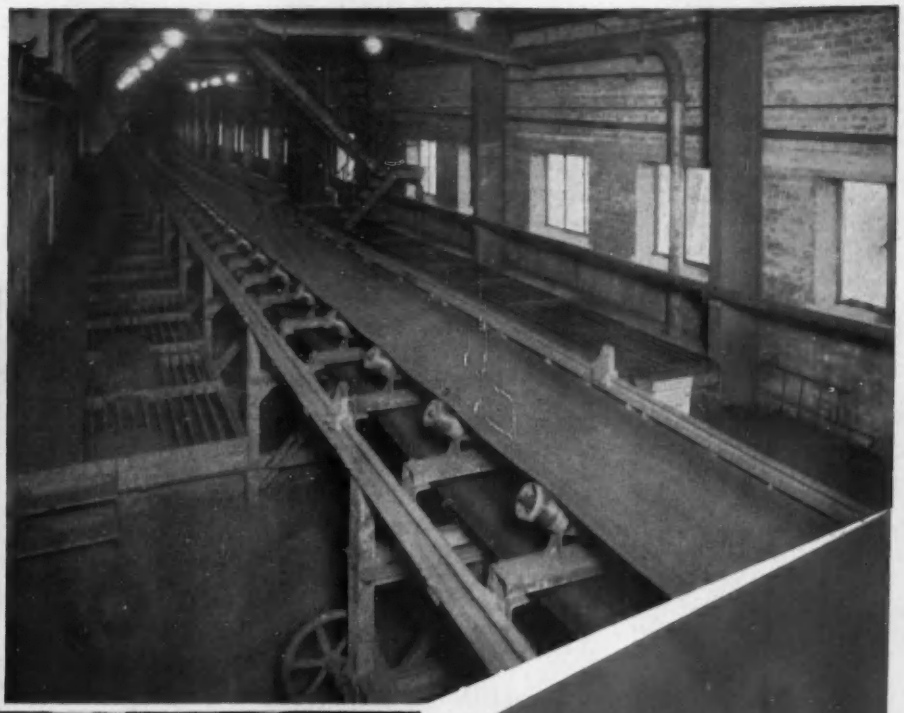

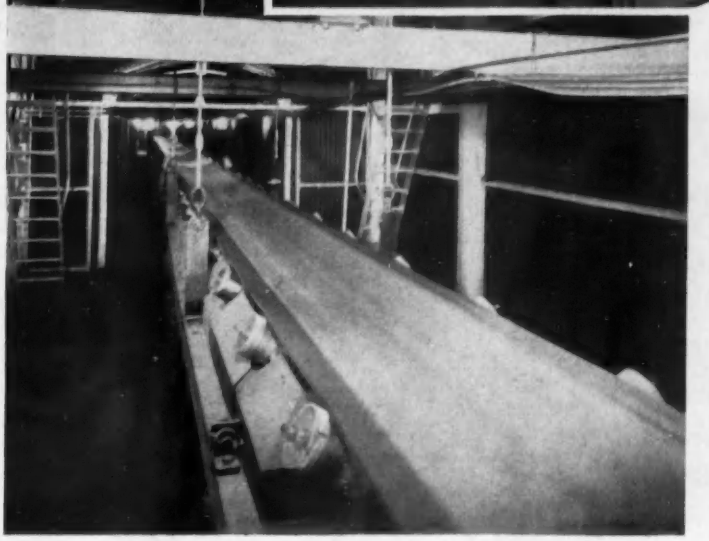

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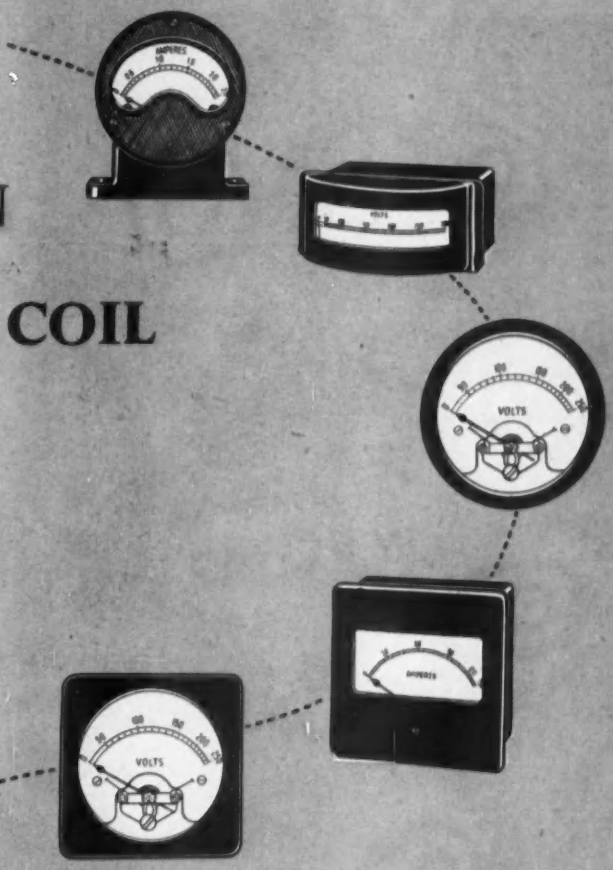

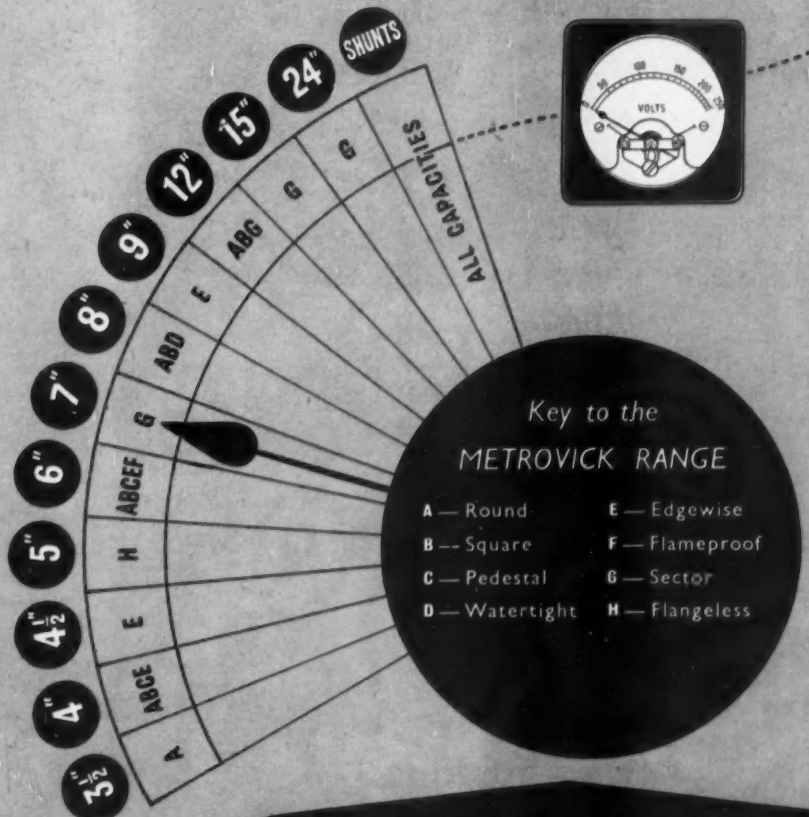

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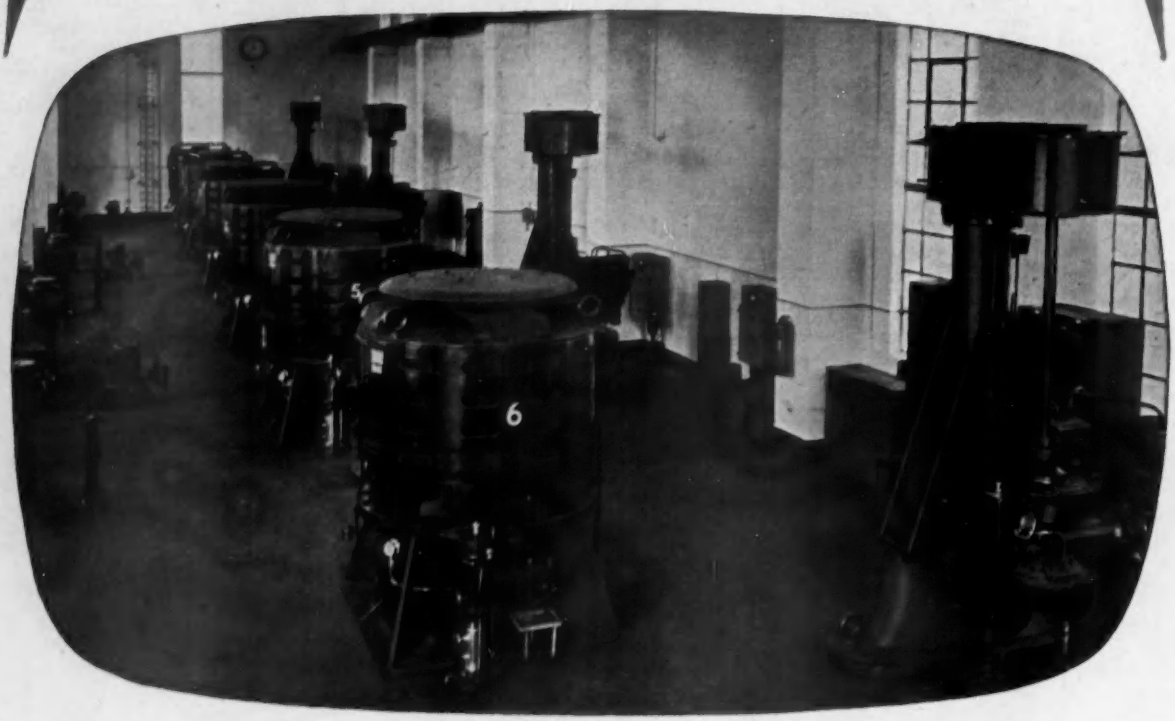

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Interior of MF2 autoswitch

MF2 autoswitch (with isolator)

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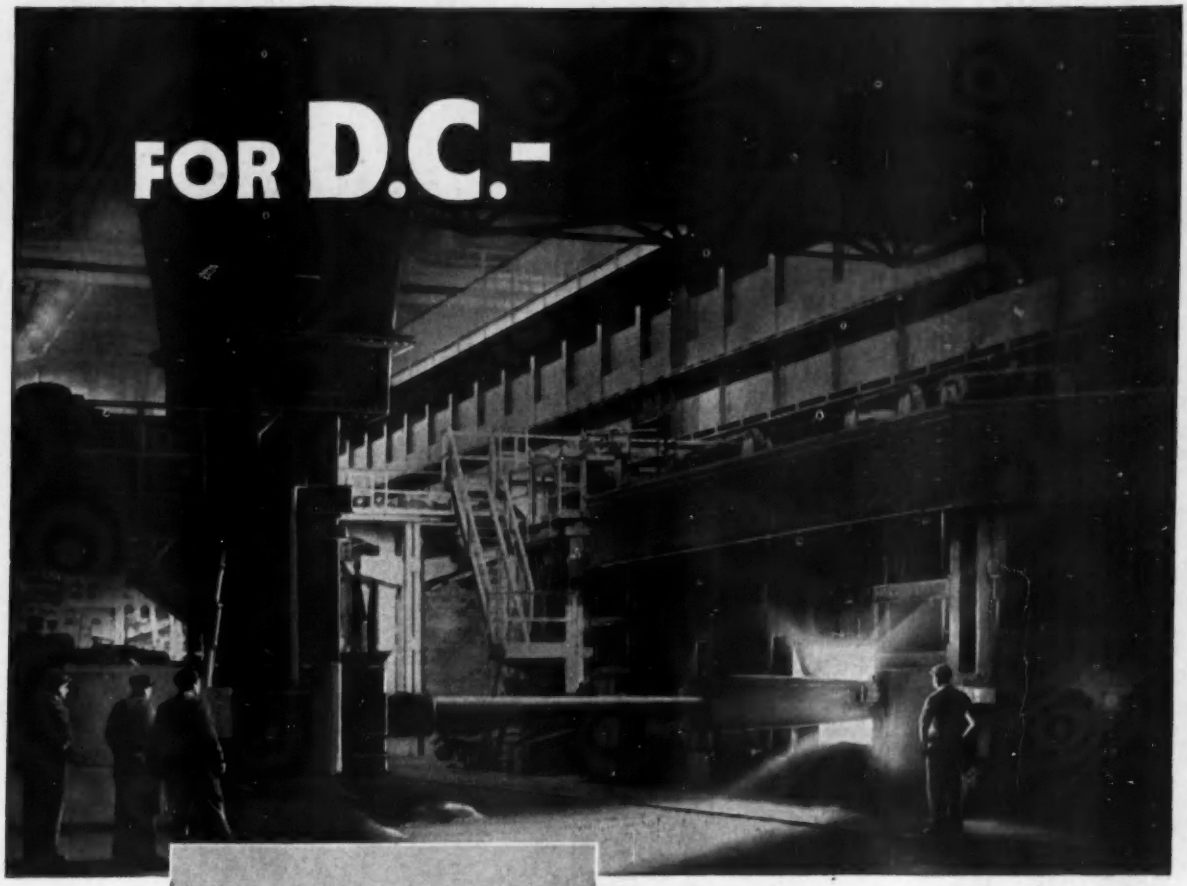

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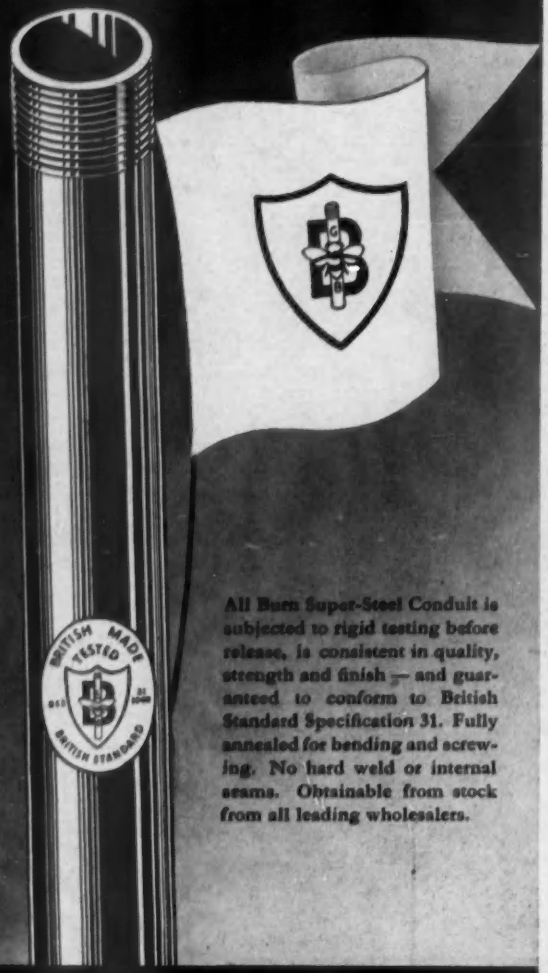

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View of Unit

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View of Housing

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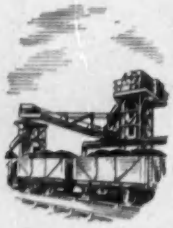
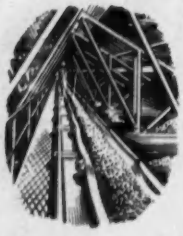
ALL ALONG THE LINE IT'S IC





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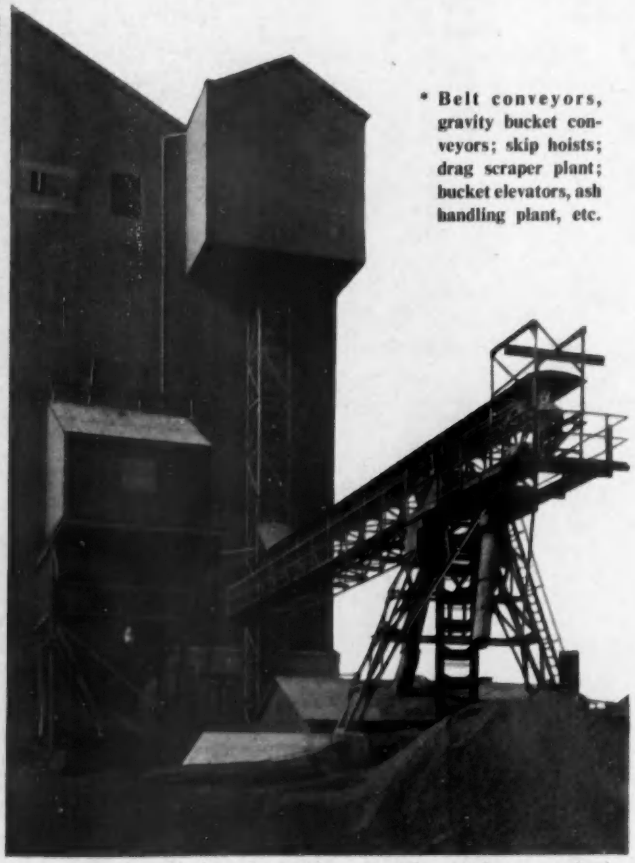

* **Belt conveyors, gravity bucket conveyors; skip hoists; drag scraper plant; bucket elevators, ash handling plant, etc.**

Gravity bucket conveyor, with capacity of 60 tons per hour, at a steelworks.

ENTERPRISING ENGINEERING

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EMERGENCY

Although the Emergency Regulations signed last week contain clauses relieving supply authorities of the obligation to supply and providing for rationing of electricity, these are to be regarded solely as extreme defensive measures. They require authorisation of the responsible ministers to be effective, and while release from responsibility to maintain conditions of supply are always welcome, only a prolonged strike would lead to this relaxation. As for rationing, this raises all the old familiar difficulties with the shades of the Clow surcharge in the background. If Hitler failed to bring about rationing of electricity it is unlikely that Mr Baty will succeed, for the electricity supply is better fitted than most large industries to withstand siege, and as industrial production goes into low gear from want of raw materials, by just so much will the task of generation be eased. While the coal stock position at power stations is not as bright as one would wish, at the third week in May some five weeks' supply at current rates of use were held. In practice, however, the danger point is reached when stocks fall below two weeks' supply owing to the distribution position. However, by concentration of coal deliveries on short haul runs and by continuing use of water-borne coal together with the full use of the transmission network, it should be possible to keep supply going with little more than some additional headaches for the operating staff. The real danger, as the Prime Minister emphasised in his weekend broadcast, will lie next winter, for the rail strike may interfere with the record build up of coal stocks which is essential if we are to start the winter with sufficient fuel in hand.

ALL SELL ELECTRICITY

Electricity boards are paying increasing attention to the training of staffs for their service centres. If these large organisations feel this necessity to adopt formal methods of bringing out the best in their salesmen, can private electrical retailers afford to neglect such training? This question was one of the most interesting raised at this week's Annual Conference of the Electrical Contractors' Association. The author who posed it suggested that the answer might be found in the co-operation between selected manufacturers and the E.C.A. in the formulation of courses on how to sell individual appliances. If such a scheme is to be really effective in teaching small groups of men or even individuals, it is likely to be expensive. It will require the printing of well-illustrated instructional booklets and perhaps the preparation

Owing to the difficulties of distribution during the present emergency we are forced to take special measures and in this week's issue the number of editorial and advertising pages has been reduced. Normal issues will be resumed as soon as conditions permit.

of film strips and other visual aids. But is such expense really justified? The Electrical Development Association has already in operation schemes for training electrical salesmen at many different levels. It may at first sight seem impossible that these could be offered to electrical retailers, who are in competition with area board service centres, but surely this narrow attitude should not prevail. Any electrical appliance sold is a load-builder, whoever may have clinched the bargain, and the whole object of the sales courses is obviously to obtain more and more sales. Admittedly, a course designed for electricity boards may not be fully effective for the electrical contractor's sales staff without some modification, and there would have to be some careful negotiation on the question of costs. But in spite of such considerations, the interests of electricity development in the widest sense demands that there should be a closer look at the possibility of E.D.A.—E.C.A. co-operation in this important field of salesmenship training.

RURAL DELAYS

Understanding of the problems of electrical supply is hardly to be looked for in the publications of the Council for the Preservation of Rural England. None the less, the recently published annual report of that organisation comes as something of a disappointment after the moderate tones adopted by a statutory body with similar interest, the National Parks Commission, in another recent report. While the Commission pays tribute to the willingness of area boards to recognise the strength of "amenity" considerations, the Council comments tartly that "the measure of their response can be gauged by the extent of the disfigurement from overhead transmission lines all over the country." Though C.P.R.E. is willing to pay lip service to the benefits electricity can bring into the countryside it is obstinate in calling for underground cables to replace overhead lines in the necessary distribution systems. It is on the national parks that the battle centres, and here the Council is becoming increasingly intransigent. Inevitably, if there are prolonged and vigorous objections to plans for overhead lines, then the furnishing of a supply to small groups of consumers deep in the countryside is delayed. It is now the argument of C.P.R.E. that this is the fault of the area boards concerned—they should give in at once! This argument might carry more weight were there not available the further testimony of the National Parks Commission on this very point, that "experience shows that reasonable compromises can be found in many cases"; hardly the conclusions to be reached if area boards were maintaining their point of view obstinately and without good reason. The fact is, unfortunately, that C.P.R.E. has an immediate reaction of opposition to all things electrical.

A GOOD START

The extent to which the industrial fuel user is taking advantage of the facilities provided by the National Industrial Fuel Efficiency Service (N.I.F.E.S.) is well indicated in the first Report issued by that organisation. At the time of formation of N.I.F.E.S. as an independent advisory service divorced from direct Ministerial control, some doubt was expressed as to the extent of industrial interest in fuel saving, as in many cases fuel costs represent only a small proportion of the overheads of manufacturing concerns. In the event, advice has been requested by about one out of every six consumers using more than 100 tons of fuel per year. Perhaps a more important feature reported is the spontaneous demand which has arisen for regular visits to works to ensure that once high efficiency has been attained, deterioration is prevented. This regular service is of the greatest importance to the smaller firm where a whole-time specialist cannot be economically employed. As far as direct electrical interest is concerned, the principal work of N.I.F.E.S. remains in the field of combined generating and process steam plants, and here the progress reported is a little disappointing. It is still uncertain whether the high hopes held out for the combined plant for fuel saving can be justified on financial grounds. Work is however continuing and no doubt the position will become clearer as more data is accumulated and analysed. Looking at the picture as a whole, the Report indicates that N.I.F.E.S. is competently fulfilling the task set for it and is making a most important contribution to the solution of the increasingly vital problem of fuel conservation.

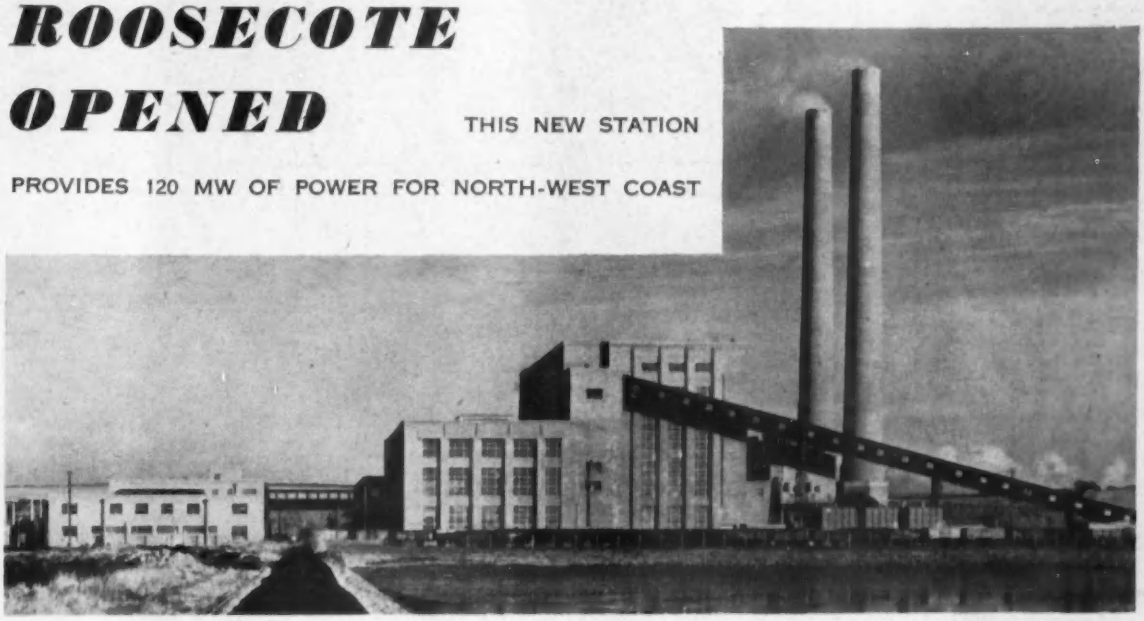
SPEEDING THE TRAFFIC

The increase in road traffic in London, consequent on the rail strike has provided a major problem of traffic control. It is significant that at many points of critical importance operation of traffic signals has been taken over by the police who have introduced a degree of flexibility unobtainable in the normal way. By this means the traffic has, more or less successfully, been kept moving. While it is perhaps impossible for the vehicle-actuated system to be developed to the pitch where it can assess a situation accurately and deal with emergency circumstances, there would certainly appear room for development of the large co-ordinated system. Already, marked improvement has resulted from the new Marble Arch—Tottenham Court Road installation, which deals with the notorious length of Oxford Street, and the complex integration centred round the Monument has recently proved its worth. There should be no difficulty, with present electronic techniques, in applying full co-ordination to long stretches of trunk feeding roads, and it would then be possible to introduce two regimes, one for incoming rush-hour traffic in the morning and one for the outgoing traffic at night. The rail strike has provided experience of what may well be normal vehicle flow in only a few years' time. If London's traffic is not to come to a standstill this experience must be put to use in the development of even more efficient automatic control.

Meteor

ROOSECOTE OPENED

THIS NEW STATION PROVIDES 120 MW OF POWER FOR NORTH-WEST COAST



ORIGINALLY envisaged by the Barrow-in-Furness Corporation, being one of the last of the Central Electricity Board's 30 MW set sized central stations and part of their 1951/52 programme, Roosecote Generating Station was officially opened this day last week by Sir Henry Self, K.C.B., K.C.M.G., K.B.E., COMP.I.E.E. With a capacity of 120 MW (of which the last turbo-alternator was commissioned in December), the station lies roughly two miles south-east of Barrow on a marsh bordering the sea at Roosecote Sands. It is in the immediate neighbourhood of a considerable industrial load, whilst being situated in the south-western corner of the Lake District, will be expected also to supply an increasing agricultural demand.

In area, the site occupies about 110 acres, of which 45 acres are employed for ash and dust disposal. Included in the site were 40 acres of salt mash land from 12 to 15 ft above Ordnance Datum situated east of the old sea wall embankment of the Barrow to Piel branch railway constructed many years ago across the marsh. From this level the site rose to some 50 ft above O.D. in its highest part, this ground providing 250,000 cu yd of fine sand and gravel for reclaiming the marsh land for the main buildings and railway sidings and filling the two ash pond embankments.

A valuable feature of the site is Cavendish Dock, a large expanse of mostly sea water used to supply water to neighbouring shipping docks. As the source of condenser cooling water, it saves the construction of elaborate intake works on a sea shore of extensive mud flats and has a total range of over 25 ft at springs. Moreover, the Dock's presence had resulted in the existence of a single line railway serving both it and a nearby sand pit, thus providing rail access which became the fulcrum of the installed coal siding system. To gain access by road, however, it was necessary to construct an 18 ft wide roadway from Rampside Rd, about ½ mile to the east.

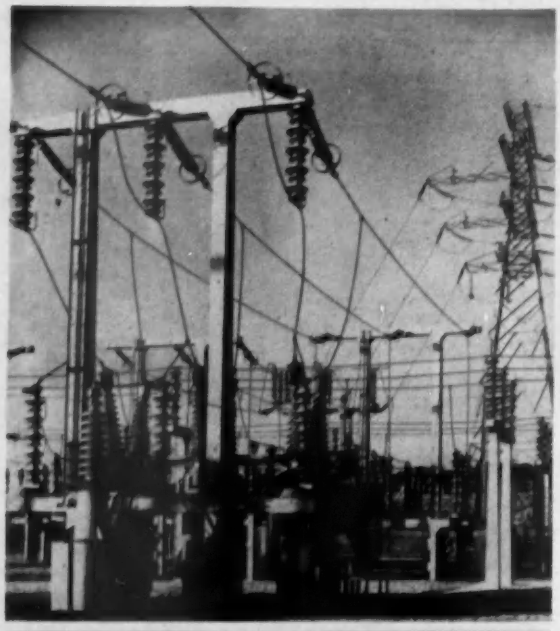
Since the site sub-soil comprises layers of sand, gravel and clay, with occasional boulders of hard rock, down to a considerable depth, piling to support the foundations was necessary. For the main and ancillary building and plant, 4,220, 16 in. diameter "Franki" reinforced concrete piles averaging 30 ft long were made on site and driven, whilst 459, 14 in. square precast reinforced concrete piles of the same length, were required to support the c.w. pumphouse foundations at Cavendish Dock, and those of the piers supporting the four, 60 in. diameter steel pipelines. Heavy reinforced concrete foundation blocks were constructed on the piling to carry the steel columns of the main buildings, turbo-alternator blocks, and boilers. Additionally, the reinforced concrete culverts for conveying c.w. to the condensers were carried on piles, which were also used to support a reinforced concrete raft carrying the heavy concrete floor of the basement.

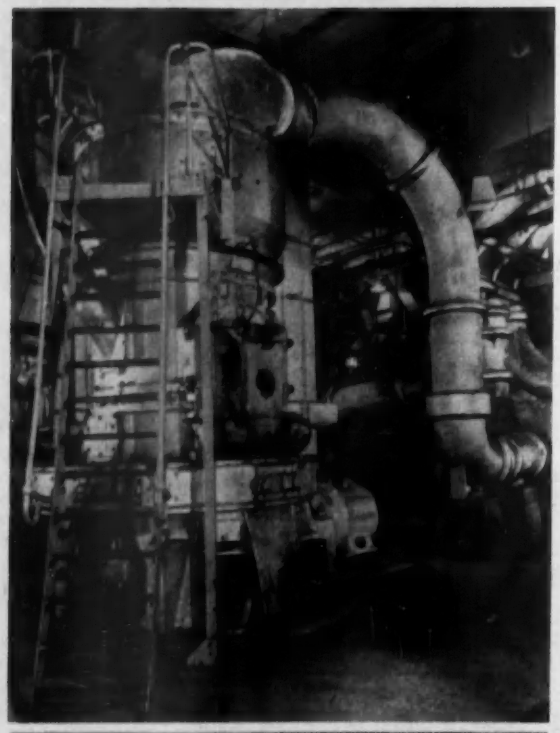
The heading illustration depicts Roosecote from the west. Its similarity in appearance to Bold A station is particularly striking in this view. The old Barrow-Piel branch line can just be seen in the bottom l.h. corner together with its sea wall embankment

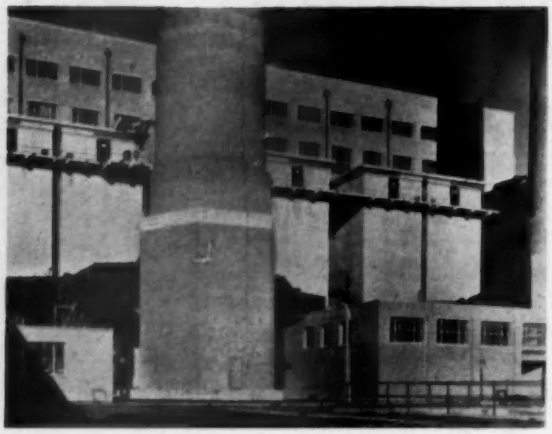
Main Buildings

For the superstructure, steel framing of riveted construction is employed, involving 3,200 tons of steel. The main framing comprises plated box columns with slab bases on reinforced concrete foundations. Approximately, overall dimensions of the turbine hall are 252 ft long by 94 ft wide by 68 ft high, and of the boiler hall, 235 ft by 102 ft and 116 ft. Cladding for the main buildings is brown rustic facing bricks, with colour-washed pressed faces internally. A similar facing has been employed for the 300 ft high plain twin chimneys. For roofing the main buildings use is made of aluminium alloy decking, overlaid with cork insulation and three-ply bituminous roofing, dressed with white limestone chippings. Copings, sills, head and canopies are carried out in a limestone-based artificial stone. Operating floors comprise precast concrete units finished in terrazzo tiling, with granolithic paving in the boiler house.

Of the three ancillary buildings, one combines the control room and administrative offices, being joined at second floor level by a bridge glazed its full length of 60 ft. Flanking this building are, on the west, workshops and stores, and on the other side, the canteen and amenities building. For these structures, steel framing and brick cladding similar to that of the main buildings has been







From top to bottom on the left are shown: a view of the grid yard, one of the "Lopulco" pulverising mills, of which there are three to each boiler, and the c.w. screens at the intake in Cavendish Dock. Above is a view of part of the electrostatic precipitation plant installed at the station

employed. Suspended ceilings with embedded hot water heating coils, and plastered walls provide the internal finishes to the administrative and canteen blocks.

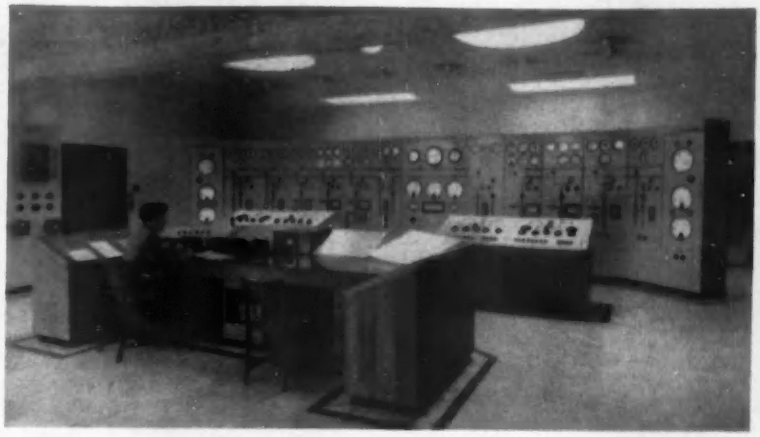
As already stated, the station has a 30 MW set size, the economic rating of the four, transversely arranged, turbo-alternators, which are aircooled, being 24 MW. Turbines are two-cylinder machines of the impulse type running at 3,000 r.p.m., with a "Duplex" exhaust. They have 23 impulse stages in the h.p. cylinder and six, double flow, impulse stages in the l.p. cylinder. Operating steam conditions are 600 lb/sq in. (g) at 850° F.

Steam is exhausted to three pass, two shell condensers at a designed vacuum of 1·3 in. of mercury absolute, when condensing 168 klb/hr of steam each, and having inlet and outlet water temperatures of 65° F and 80·5° F. The full quantity of condensate can be handled by either of the two extract pumps allocated to each machine. Similarly, each of the two steam jet, air ejector type, condenser air extractors to each set has a 100% capacity. Each is fitted with a quick start ejector taking 20 mins. to raise rated vacuum. Steam is bled from the h.p. cylinders at 157 lb/sq in. and 49 lb/sq in. (abs.) and from the l.p. cylinders at 14·38 lb/sq in. and 3·62 lb/sq in. (abs.) for feed water heating, the final feed water temperature being 345° F maximum.

Boiler Plant

Operating on a range system, the four, p.f. fired boilers deliver 300 klb/hr of steam at b.s.v. conditions of 625 lb/sq in. and 865° F. Each boiler, independently supported from the building superstructure, has two drums, whilst 3¼ in. o.d., finned wall tubes, and self-draining "Melesco"-type superheaters are employed. Double flow, welded economisers are fitted, with tubular air heaters and automatic hydraulic regulator control of the main dampers. Three "Lopulco" pulversing mills serve each boiler.

Control of each boiler is effected automatically with "Electroflo" pneumatic/hydraulic equipment, Kent steam temperature control being used to operate the tilting burners. For forced draught, two single inlet fans with differential inlet control operate with each boiler whilst induced draught is effected by two double inlet fans also having differential inlet control. Each boiler is served by three exhauster fans, fitted with paddle wheel impellers and driven by variable speed motors. Electrostatic preci-



A high level of lighting without glare is obtained in the control room by the use of louvred and spot-light fittings

pitation is installed, the dust from the flue gases being extracted from the precipitators and chimney hoppers under vacuum induced by water ejectors and discharged into the sluicing system.

Electrical Arrangements

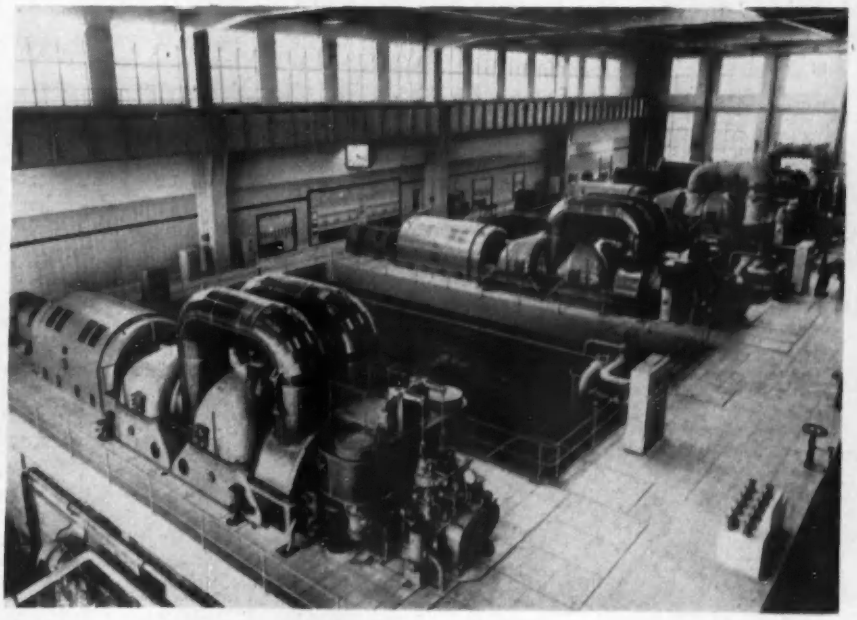
Conforming with modern practice, the alternators are connected directly to the 132 kV system through 11·8/132 kV, 36 MVA generator transformers in a 132 kV switch compound situated to the north of the main buildings. Accommodation in the compound is provided for four such transformers, together with main switchgear, two 132/3·3 kV station transformers, and four feeder circuit-breakers with bus couplers and section switches. All circuits are connected to a double busbar system, whilst the main 132 kV switchgear is of the outdoor bulk type, 2,500 MVA rupturing capacity.

Supplies for auxiliaries are drawn from four unit transformers coupled directly to the alternators, but supplies can be taken from the 132 kV system through the two station transformers in the switch compound, which feed into the 3·3 kV busbars. Several of the larger auxiliaries take a supply direct from the 3·3 kV main board, the remainder being fed at 415 V. Auxiliary switchgear—of the air-break type for 3·3 kV, and switch fuse type for 415 V—is situated in annexes adjoining boiler house and turbine room.

In the control room, the main mimic diagram remote control switchboard provides for outgoing 132 kV feeders, bus sections and couplers, generators, and synchronising equipment apart from the general purpose intaking panel. Four generator control panels of the desk type are placed immediately in front of the board. Direction relays for generators, station transformers, feeder, busbars and the main station interconnecting meter are housed adjacently.

In view of the nearness of coal mining areas, all coal supplies for the station are rail borne, the weekly consumption of the station being 2,000 tons at 20% load factor. Coal is unloaded by two 25 ton capacity side discharge tipplers and weighers, from which it can be conveyed by single belt conveyor direct to the boiler, or deposited in the 67,000 ton capacity coal store by radial arm conveyor. Ash is handled by a high pressure sluicing system, comprising two h.p. pumps, two clinker crushers, and two ash pumps which deliver the ash to the settling ponds.

For the circulating water system, four bitumen-lined steel pipes, supported above ground at intervals on piled foundations, have been laid across the Salthouse Pool section. The remainder comprises underground, reinforced concrete culverts, built in with the station foundations. To provide the c.w. flow, the pump house alongside the dock houses four horizontal spindle double-suction centrifugal pumps, each capable of pumping 23,000 g.p.m. against a head of 40 ft.



The turbine room at Roosecote, showing all four sets and the general layout

PRINCIPAL CONTRACTORS

Consulting engineers	Merz and McLellan
Civil consultants	James Williamson and Partners L. J. Couves and Partners
Boiler plant	Yarrow and Co., Ltd.
Coal handling	Robert Dempster and Sons Ltd.
Ash and dust handling	B.V.C. Industrial Constructions Ltd.
Turbo-alternators	Metropolitan-Vickers Electrical Co., Ltd.
Feed heating and condensing	Vickers-Armstrongs Ltd.
Boiler feed pumps	Harland Engineering Co., Ltd.
C.W. valves	J. Blakeborough and Sons Ltd.
H.P. pipework	Alton and Co., Ltd.
L.P. pipework	Simmons and Hawker Ltd.
Central evaporating plant	Alton and Co., Ltd.
C.W. pumps	W. H. Allen, Sons and Co., Ltd.
Raw Water treatment	Permutit Co., Ltd.
Main switchgear	Ferguson Pailin Ltd.
132 kV transformers	Metropolitan-Vickers Electrical Co., Ltd.
Auxiliary switchgear	English Electric Co., Ltd.
Protective relays	Metropolitan-Vickers Electrical Co., Ltd. P. and B. Engineering Co., Ltd. A. Reyrolle and Co., Ltd.
240 V batteries	Tudor Accumulator Co., Ltd.
Rectifiers	Electric Construction Co., Ltd.
Auxiliary transformers	Metropolitan-Vickers Electrical Co., Ltd.
Cabling	Aberdare Cables Ltd. Hackbridge Cables Ltd.

Contractors talk Trading

Retail activities hold attention at Margate Conference

DESPITE transport difficulties, a good gathering of contractors assembled on Sunday at Margate for the annual conference of the Electrical Contractors' Association. The programme of the conference was arranged somewhat differently from that of recent years, a concert being organised for Sunday, and the business sessions being confined to Monday and Tuesday.

First business on Monday was the opening of the Conference by the Mayor of Margate. After this, the President of the Association, Mr A. F. Plummer, delivered an address.

Presidential Address

Mr Plummer emphasised his conviction that the electrical industry is passing through a very important phase of its history. The outcome will be mutually beneficial to all sections of the industry, or otherwise, according to the state of co-operation which was developed.

One of the most serious matters of concern is productivity. Better working conditions have been introduced compared with pre-war, and there is greater mechanism, yet in Mr Plummer's opinion, output per man hour is substantially less than it was before the war; he referred in this connection to the "strange absence of authoritative statistics revealing the comparison of pre-war with post-war" productivity. It might be an advantage if the brains employed in the Monopolies Commission as a completely independent body were concentrated instead on making full investigations into why output has fallen so badly.

One recent event of great importance to electrical contractors is the inauguration of the Registration Board of the National Inspection Council. Effectively, this is a new and enlarged scheme for the voluntary registration of electrical contractors. In this respect the policy of the E.C.A. remains the securing of statutory registration of electrical contractors and operatives. However, it is agreed that the new organisation should be given ample opportunity of proving its value to secure added protection of the public.

From technical matters, the President moved to trading. He repeated his Annual Dinner insistence that trade discounts should be restricted to the trade; to the people who accept responsibilities in the distribution of electrical goods. For those who buy electrical goods on a large scale for their own use, a schedule of quantity discounts is needed, which in no way interferes with the trade discount, and which is designed to recognise and encourage the purchase of electrical goods in large quantities.

The solution to the problem, in which wholesalers were especially involved, may lie in providing Registers listing the various classes of user, not just for one or two commodities, but the whole range of electrical goods. There would be a short list of very large users who should purchase at terms equal to the trade discount; then a further Register of large users entitled to a lower preferential discount would be produced. In Mr Plummer's opinion this would add enormously to the potential business available to the contractors, and N.E.C.T.A. would give co-operation and support in the preparation and operation of such Registers.

A little progress in the desired direction is being made, with various sections of manufacturers recognising the equity of the differential between trade discount and that granted to special large buyers. However, in general, the position remains unsatisfactory, and increasingly electrical contractors are being asked to quote only for the provision of labour in the execution of industrial contracts.

Another topical question is relationships in trading between E.C.A. members and the area boards. Increasing goodwill has been the result of continued operation of the Summary of Agreed Principles for Trading. Although there may be different points of view between area boards and private traders concerning their competitive activity, there was no area in which there was not a desire for co-operation. However, the effect in some areas remains more satisfactory than in others, and continued effort is needed. The E.T.U., in its evidence to the Herbert Committee has attacked this co-operation between E.C.A. and area boards, yet area boards and E.C.A. working together can make a prosperous industry not at the expense of the manual workers, but for their benefit. In the U.S.A. the most striking difference in the contracting industry is that the Union concerned there wants a set of prosperous employers, realising that employee's prosperity is in direct ratio with that of the employers.

Hire Purchase

Hire purchase is a topic of continuing importance to electrical contractors and retailers, and their interest was reflected in the attention given to the paper on the subject presented by Mr C. C. Worters, secretary of the Hire Purchase Trade Association. An initial point he made was that although hire purchase could be a valuable sales booster, every care needs to be taken that sales which could and would have been made for cash, or on short-term credit, are not converted into a long term hire-purchase agreement.

A hire-purchase agreement can be summarised as one in which a particular article is let on hire at a specified rent, the hirer being able to compel the owner to sell although the owner cannot compel the hirer to buy. Financing of such agreements is often arranged with a firm specialising in this business, the supplier selling the equipment to them for cash. However, a retailer may decide to finance his own hire-purchase transactions. In this case, the capital required for this business will vary according to three factors:

(*a*) The monthly total of hire-purchase sales.
(*b*) Cost of replacing stock, and the length of credit that can be obtained from the manufacturer.
(*c*) The terms of the hire-purchase agreement—deposit and length of transaction.

For a steady turnover, the capital employed in such work will reach a peak and then diminish. The table shows the position for a cash price sale of £100 a month, with a replacement cost of £75/month. Deposit is 10%, and repayment is spread over 24 months. Note that credit charge is ignored, being assumed just to cover the cost of granting credit. Income tax and standing overhead charges are also left out of account, the effective assumption being

CAPITAL NEEDED FOR H.P. FINANCING OF £100 SALES/MONTH.

Month	Receipts* £	Cumulative total of capital £	Month	Receipts £	Cumulative total of capital £
1	10	65	17	70	595
2	14	126	18	74	596
3	18	184	19	78	594
4	21	238	20	81	588
5	25	288	21	89	578
6	29	334	22	93	564
7	33	376	23	96	546
8	36	415	24	100	525
9	40	450	25	100	500
10	44	481	26	100	475
11	48	509	27	100	450
12	51	533	28	100	400
13	55	553	29	100	375
14	59	569	30	100	350
15	63	581	Cumulative capital decreases to nil by Month 45.		
16	66	590			

**All totals to nearest £1. £75/month for replacement of stock. 10% deposit, 24 months repayment. Monthly receipts £10 deposit + rentals.*

that the whole gross profit can be used to minimise the finance required. It will be seen that the total capital employed rises to almost £600 in the 18th month.

Terms for hire-purchase agreements are in some cases controlled by a Statutory Order at present, but in general, they are entirely free of restrictions. In the author's view, however, the deposit should always be substantial, partly as a check on the financial stamina of the hirer. Period of payment can be dealt with by saying "as short as possible," in the interests of everyone concerned. Finally comes the credit charge. Mr Worters asks that it should not be called "interest," because the use of that term gives a false impression. Besides interest proper, the credit charge has to provide for necessary investigations and book-keeping, for collection expenses and associated overheads, and for the provision of a reserve against bad debts.

To conclude the paper, there comes a summary of the requirements of the hire-purchase Acts, and of associated emergency legislation.

Sales Promotion

Sales promotion—an investment in the future. The very title of the symposium presented at the Tuesday afternoon meeting of the Conference bubbles with the confidence and enthusiasm that distinguishes the papers composing it.

First comes an introduction by Mr H. S. Wathes, chairman of the Electrical Retailers' National Committee which set the tone for what followed. Today, he says, business tends to be diverted from the relatively small family concern to the large publicly-owned company. That trend will be accelerated or retarded in direct proportion to the quality of the service which is given to the public by the small firm, and the effectiveness of sales promotion.

"It pays to advertise" is the theme of the first of the three supporting papers, contributed by Mr N. C. Walker (Walker Bros. (Electrical Engineers) Ltd., Birmingham). He divided advertising into two parts, the first "unconscious advertising," covering such matters as the shop window, letter headings and vans.

Conscious advertising he distinguishes as the kind that hurts, and his emphasis is on planning. The advantage lies, he suggests, with putting these plans in the hands of an advertising consultant. The question still remains, however, how much shall be spent on advertising. Much depends on geographical position and competition. For a firm, which has modern premises in a large city, situated about 10 minutes from the nearest area board service centre, with few competitors in the same line, but furniture shops with electrical aspirations in every direction, £5,000 is suggested.

Contracting aspects of sales promotion are dealt with by Mr J. P. Inglis (Drake and Gorham (Contractors) Ltd.). He emphasises the importance of first impressions obtained by customers, especially as applying to staff and equipment.

With regard to obtaining work Mr Inglis suggests that from time to time the proportion of time and effort expended on abortive quotations occasioned by advertised invitations to tender should be considered. Such time may in part be turned to better advantage in other directions. A better way of obtaining work may be to employ an outside representative.

Too Many Contractors?

Any consideration of sales promotion raises the question of the future of the industry. One point is, are there too many contractors? Undoubtedly those attempting to operate on little capital are forced to turn out work of very low standard, which is covered by the building construction. Although the ambition of the independent man is understood, it may be better for him to combine with others to form a larger and sounder unit, less dependent on "the crippling and often disastrous effects of slow payers or bad debts."

Something of the same question applies to larger established firms. It is possible that amalgamation into larger units with greater resources might lead to a fairer reward for the services rendered. Larger units seem certain to be required to handle the increasingly complicated electrical services provided in buildings and plants of all descriptions, but close co-operation between firms may be an alternative to amalgamation.

Finally in this symposium comes a paper by Mr R. Cussins (Cussins and Light Ltd., of York) dealing with the staff side of selling. One arrangement he finds useful in his own 75-staff firm is an occasional senior staff meeting. These are held in the evenings, beginning with a meal in a nearby restaurant, and are attended by the heads of each section of the firm with in addition two employees who are not heads of departments attending each meeting in turn.

Profit sharing is in force in the author's firm, and he emphasises the need for making clear to the staff the basis of calculation of each person's share. He considers it preferable to individual sales commission. However, superannuation and insurance are also important, and count for more with employees' wives.

Electricity boards gives much attention to the training of their showroom staff, and the introduction of equivalent courses for the employees of private contractors is important. Perhaps the best hope lies in co-operation with certain manufacturers of different classes of products, so that the cost of preparing courses may be shared between the manufacturers and the E.C.A. Film strips, booklets and charts seem to be the type of thing required, with the emphasis on pictorial presentation.

A welcome showroom help would be a standard size of catalogue sheet. The suggestion is made that the manufacturers might print information of new products on B.S. size sheets, on the understanding that each sheet would be circulated by the E.C.A. to members expressing an interest in the types of goods concerned. Possibly a charge might be made for such a service.

100 years of ALUMINIUM

ELECTRICAL DISPLAY PROMINENT IN CENTENARY EXHIBITION

IT is only 100 years ago (27th March, 1855, to be exact) that Michael Faraday displayed to a meeting of the Royal Institution, the first few fragments of aluminium to be made in this country. In the following century this metal leapt into prominence in the non-ferrous world—the total of close on three million tons now produced annually exceeds that of all other non-ferrous metals put together. Of this total, about one tenth is fabricated and used in the U.K., the electrical industry being no mean consumer taking just over 6%. To commemorate this fantastic rise in the importance of aluminium, the Aluminium Development Association are holding a Centenary Exhibition at the Festival Hall depicting, in an almost bewildering display, some of the uses of this metal. Coupled with the exhibition, which is open until tomorrow, is a series of technical discussions covering applications in specific industries.

It was in many ways appropriate that the series should have commenced with the electrical industry, the discussion on Wednesday of last week being opened with a brief paper by C. H. E. Ridpath, B.SC., M.I.E.E., A.M.I.MECH.E. (Aluminium Wire and Cable Co., Ltd.), largely devoted to the uses of aluminium as a conductor. In this country aluminium has been used for o.h. lines since 1896, and there are today some 25,000 conductor miles in service. Originally all aluminium conductors were employed, these being satisfactory for spans up to 200 ft, and hence particularly applicable to l.t. street distribution. Recent years have seen a marked increase of all aluminium conductors for such purposes, savings of up to 30% of total installation costs being possible.

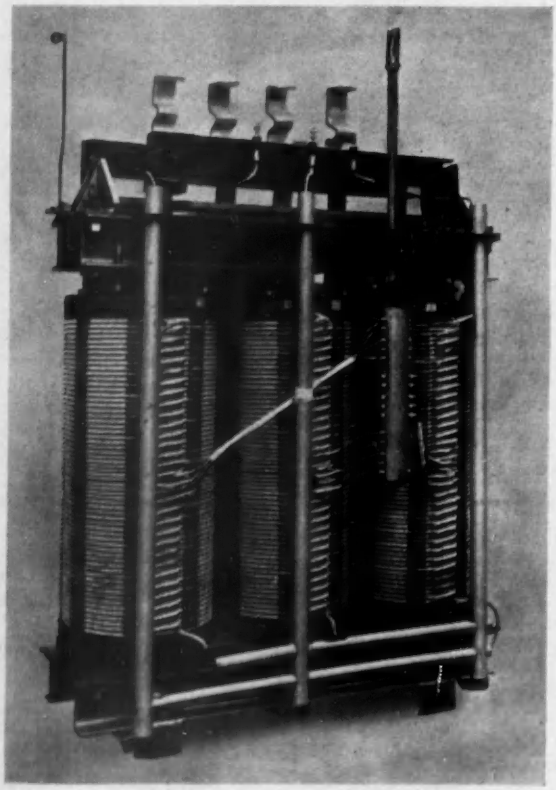
The most notable use of aluminium, however, is in a steel-cored conductor, the core, apart from permitting longer spans, providing a tough standby should the aluminium strands have been damaged by flashover. Although with an increased proportion of steel, s.c.a. conductors can be designed for long spans, steel-cored conductors having an outer of aluminium alloy containing principally 0·5% magnesium and 0·5% silicon is more suitable. Associated with such conductors is a variety of aluminium, or aluminium alloy joints, suspension clamps and tappings. Mention is also made of bi-metallic connectors in which the aluminium and copper alloy parts are separated by a suitable washer to keep the internal metallic junction dry.

Another important contribution of aluminium has been in paper and rubber insulated power cables, where the use of aluminium for both sheathing and conductors affords a weight reduction of 50% to 10% over copper-cored, lead-sheath cables. Aluminium is also seen in growing use in aircraft and transport cables and for l.t. distribution, whilst progress is being made in aluminium windings for large transformers and alternators. Many applications offer themselves for aluminium busbars with bolted joints in which the danger of high resistance connections is negligible.

The electrical section in the exhibition itself reflected much of the ground covered during the discussion, particularly worthy of study being specimens of aluminium busbar, and joints taken from actual installations. Apart from selection of conductors, cables and accessories, related uses for aluminium, in the form of motor housings and die cast rotors, merited attention. Most impressive was the English Electric experimental transformer with aluminium windings, shown in the outside display.

Aluminium is a suitable busbar material as shown by this feeder installation in British Lion Film Studios (contractors Troughton and Young)

Windings of the English Electric experimental aluminium transformer made as far back as 1951 (below) in which core and winding weigh 1·55 tons. Rating is 420 kVA 6·6 kV/433V with tap changing. Recent developments have led to improved jointing methods



AUTOMATIC PROTECTION

Some Notes on the Legal Aspect–Part One

by H. W. SWANN, O.B.E., D.F.H., M.I.E.E.

I HAVE had occasion lately to look at some of the various codes of Statutory Regulations to try to form an idea of the opinion a Court of Law might express on the subject of automatic protection of electrical systems or circuits forming part of them. It has not been altogether light reading because no two of the codes refer to the subject in the same terms, and there are not many definitions of their legal meaning. The Factories Regulations talk about protection from excess of *current*. The Supply Regulations mention excess *energy*, whilst in Coal Mines automatic means are required for cutting off all *pressure* in event of a fault.

The Institution Regulation (12th Edition) desires, in delicate phrasing, protection against persistence of an excess-current *condition*, and in Northern Ireland although the Ministry of Commerce asks for a safety fuse or circuit-breaker, it does not specify the purpose—it just has to be there.

Criterion Definition

I have searched around for some common denominator, or a yard stick with which to measure the effect of these and other requirements and think it may be found in the common object of preventing danger. This term is well and truly defined in the Factories Regulations, and I have taken the text as a criterion against which I have attempted to judge the effect of the various codes and their relative success in achieving the prevention of danger resulting from short circuits, overload, and earth fault.

> DEFINITION OF DANGER.—THE ELECTRICITY (FACTORIES ACT) SPECIAL REGULATIONS 1908 AND 1944.*
> "Danger" means danger to health or danger to life or limb from shock, burn, or other injury to persons employed, or from fire attendant upon the generation, transformation, distribution, or use of electrical energy.

It is worth noting at this point that a general study of the codes leads to the conclusion that electric shock was the predominating risk in the minds of those who drafted them. Thus the clauses devoted to automatic protection are relatively few in number and I think the danger of fire, against which it is perhaps the chief safeguard, was not evaluated as it would be in the perspective of today. What was in mind when the regulations were issued, however, has little importance in a Court of Law. The wording of the regulation will be interpreted in terms of conditions applying when alleged offences were committed.

> REGULATION 8.—ELECTRICITY (FACTORIES ACT) SPECIAL REGULATIONS 1908 AND 1944.
> Efficient means suitably located shall be provided for protecting from excess of current every part of a system, as may be necessary to prevent danger.

In the Electricity (Factories Act) Special Regulations 1908 and 1944, requirements as to automatic protection appear in Regulations 4, 5, and 8. Of these the last ought to have come first because it lays down the principle whilst the others refer to ways and means. Regulation 8 is typical of the general terms which characterise this ancient code and it makes no specific mention of automatic protection but merely asks for "efficient means" to be provided for protecting from excess current. Whilst the inference is that this implies something automatic, because there seems to be no other reasonable way of achieving the protection required, it is nevertheless a little disconcerting to find the same term "efficient means" used in the preceding Regulation No. 7 where it is generally held to require a switch which is *not* automatic. The term occurs in the latter sense also in Regulations 11 and 13 where a switch for isolating purposes is clearly implied.

A difference is apparent, however, if we turn to Regulation 9, which prohibits a single pole switch in a neutral conductor. We find that the general principle expressed by "efficient means" is abandoned in favour of an explicit permission to place an automatic or other "cut-out" in the connection between the neutral and earth at the generating station, for use in testing and emergencies only. Some engineers might think that an automatic or other cut-out in the position stated might in these days create the emergency, and no doubt the concession was only intended to meet the conditions of 3-wire d.c. working, but it is at least fortunate that it is not a requirement. My point, however, lies in the inconsistent method of expression of which the detail varies again in Regulations 4 and 5 where constructional requirements are laid down for circuit-breakers and fuses without mention of a "cut-out," automatic or otherwise.

> REGULATION 5.—ELECTRICITY SPECIAL REGULATIONS 1908 AND 1944.
> Every fuse and every automatic circuit-breaker used instead thereof, shall be so constructed and arranged as effectively to interrupt the current before it so exceeds the working rate as to involve danger. It shall be of such construction or be . . .

Regulation 5 does, however, give an indication of what is expected of a fuse or automatic circuit-breaker and as the requirements of Regulation 8 imply their use, it seems reasonable to think that the phrase "protecting from excess of current" in the latter means, in the words of Regulation 5, that the protection must be "constructed and arranged as effectively to interrupt the current before it so exceeds the working rate as to involve danger." Thus I suggest that a Court of Law might interpret the term "excess of current" in Regulation 8 as meaning any excess over the working rate which could cause danger, and I have taken the liberty of re-writing Regulation 8 interpolating the essential part of Regulation 5 and adding the definition of "danger" in full. (See next page.)

If this is accepted it leads next to the necessity of deciding what is the working rate. I do not think it means the rated capacity of say a conductor, or a motor, or a fuse, but rather the actual load current at any time under normal healthy working conditions. If this load current exceeds the rated capacity it may cause danger and thus must be

* An almost identical definition appears also in the General Regulations dealing with Electricity in Coal Mines.

interrupted *before* it does so. In general, automatic protective devices do not anticipate a dangerous increase in current value but are arranged to operate after it occurs, a fact which introduces the question of the time it takes to become dangerous.

REGULATION 8.—(EXTENDED TO INCLUDE THE EFFECT OF REGULATION 5.) ELECTRICITY SPECIAL REGULATIONS 1908 AND 1944.

A fuse or an automatic circuit-breaker used instead thereof shall be provided for protecting from excess of current every part of a system and shall be so constructed and arranged as effectively to interrupt the current before it so exceeds the working rate as to involve danger to health or danger to life or limb from shock, burn, or other injury to persons employed, or from fire attendant upon the generation, transformation, distribution or use of electrical energy.

Looking at this point in relation to short-circuit amounting to many times the working rate, it is apparent that danger arises immediately. A person in close proximity to the point of short-circuit may sustain burning injuries—a fact which affords legal proof of danger within the defined meaning of that term. Many such cases have occurred and it could be held that the automatic protection should have interrupted the current *before* it involved danger. This is one of the places where the tag "so far as is reasonably practicable" might with some advantage have been added to modify the absolute requirements of the regulation, but as it stands I believe it is really asking for something which is nearly, if not quite, a technical impossibility.

Degree of Danger

The time allowable for the persistence of overload, as distinct from short-circuit, introduces the question of the degree of danger, a point which is easier of legal determination after something has burned out than before. Circuit protection is often set at about twice the normal working rate and provided there is no evidence of heating, such as smell, it is assumed that no danger is incurred. The I.E.E. Regulations (12th edn.) seek to relate the operational settings to the conductor ratings, and thus we read that a circuit-breaker should open at current values of up to twice that rating (Regulation 611) whilst fuse ratings should not exceed it (Regulation 612 (*c*)). There is, however, no reference to the time factor except in so far as the prevention of "persistence of an excess current condition" which appears in Regulation 110, may be considered an overriding requirement. A 50% overload above the conductor rating would, I think, be an "excess current condition," but its persistence would not be prevented by a circuit-breaker set to operate at 100% overload or by a fuse with the common fusing factor of say 1·8.

Thus the regulations of the I.E.E., which so often afford guidance as to the manner in which a generalised Statutory Regulation should be interpreted in terms of the accepted good practice of the day, are perhaps not altogether clear as to the ways and means of dealing with overloads, although it is the evident intention that such a condition should not be allowed to persist. It is reasonable to assume that "persistence" implies "danger" and thus that the Statutory Regulation might be held to require that any current values in excess of those given in the rating tables are dangerous and should be automatically interrupted. The contrary view leads to questions of how much excess current may be tolerated safely for how long—questions which might be embarrassing for an expert witness in a Court of Law.

It is not altogether a matter of effect at once following cause thus comprising a compact event which may or may not involve danger. For instance, the starting current of a motor often represents an overload in excess of both the rating of the conductors and the protective devices and various expedients are commonly adopted to prevent the operation of the latter. This introduces danger only if the starting period is abnormally prolonged, or if the number of starts in a given time exceeds that normally expected, but if danger is actually caused it seems likely that the Regulation has been contravened. Again, a series of intermittent heavy overloads which individually cause overheating of the conductor may, even if spread over a long period, damage the insulation to the point of breakdown leading to short-circuit or earth-fault. In such a case it is a nice point as to whether the Regulation requires protection against the initiating cause or against the breakdown which results therefrom, and I am inclined to think it asks for both.

A Question of Fuse Gear

If, after examining the requirements implied in the Regulation against the criterion of "danger," the conclusion is reached that automatic protection should operate when accepted standards of conductor ratings are exceeded by current of any amount, it is disconcerting to realise that the use of fusegear, on which the industry has relied since its early beginnings, leads on this basis to a considerable sacrifice of marginal carrying capacity owing to the effect of fusing factors. I believe that in a great many cases, probably a majority, this margin does in fact exist, but if it is desired to utilise rated capacity to a value approaching the full extent for purposes of the normal working rate then it seems necessary to have recourse to circuit-breakers of which the setting is closely related to the maximum values allowable. The point would seem to be of some importance also where demand has increased and has absorbed the margins allowed at the time of installation of feeder and sub-circuits. Another aspect of the difficulty of providing efficient fuse protection lies in its application to such things as fractional-horse-power motors where a small overload of say half an ampere may cause the danger of burn-out although it does not bring the fuse into operation. Here again, circuit-breaker protection (thermal type) seems to be indicated.

Incidentally, although it is probably irrelevant to this particular line of analysis, I think I may observe that Regulation 5 opens with the curious sentence "Every fuse and every automatic circuit-breaker *used instead thereof*, shall be . . ." I cannot think that the point I have sought to make in the preceding paragraph was in mind when the Regulations were written but if the words I have italicised have any purpose at all, they seem to visualise the possibility of a circuit-breaker supplanting a fuse.

Earth Faults

Looking next at the third function of automatic protection, that of preventing danger arising from earth faults, it is necessary to distinguish between fault current and leakage current. The term "insulation" is not technically absolute, and the very small values of micro-ampere current which trickle through insulating materials introduce no danger and are inherent to all normal and healthy conditions of working. But earth-fault current can be of any value, depending on the resistance of the fault itself and of the uncharted paths through which it subsequently flows. It constitutes an addition to the working rate which may introduce danger and thus under the terms of Regulation 8 automatic protection is required.

When earth-fault current attains a magnitude comparable to short-circuit or overload, the legal position which arises is similar to that discussed in the preceding notes on those terms. If, however, the value is less than that at which automatic operation on overload will take place the requirements of the Regulation are not fulfilled and the practice of the day seeks to prevent danger either by providing an additional protective feature which will respond to low values of earth fault current before they become dangerous, or by so reducing the resistance of the path which the current must traverse that the magnitude attained will cause operation of overload protective devices.

It is perhaps a remarkable fact that the general sense and effect of the Regulations as a whole is in the latter direction. Emphasis is placed on the need of earthing—that is on the necessity of creating an earth-fault current path which, in the words of the definition, "will ensure at all times an immediate discharge of electrical energy without danger."

DEFINITION OF EARTHED.—ELECTRICITY SPECIAL REGULATIONS. 1908 AND 1944.

"Earthed" means connected to the general mass of earth in such a manner as will ensure at all times an immediate discharge of electrical energy without danger.

In Factory Law administration, the tendency has always been to invoke the earthing clauses rather than those concerned with automatic protection, and although they are interdependent, so far as earth-fault clearance is concerned, that fact has not been taken into account when framing indictments alleging offences for purposes of legal proceedings. This, I think, is because the Department has been preoccupied by shock risk, as distinct from that of fire, and also because prosecution is usually confined to cases where earthing of the metal work as required by Regulation 13 has been omitted altogether, which rules out the possibility of earth-fault current and thus of any "excess" for purposes of Regulation 8. If, however, the earthing of, say, a portable tool has been attempted but is inadequate a shock accident may occur as the result of earth-fault and it could be held that both Regulations 13 and 8 have been contravened, in that the inefficient earthing did not ensure an immediate operation of the automatic protection and thus the discharge of electrical energy without danger.

Earthing Choice

It is evident that the offence can lie either in the earthing resistance being too high or the automatic protection being insufficiently sensitive and the occupier is, in effect, offered the choice between reducing the earthing resistance or increasing the sensitivity of the protection devices—the essential requirement being that the relationship is such that there is "immediate" operation of the latter on the occurrence of an earth-fault.

Here again therefore the question of time becomes a material factor. I referred earlier in these notes to the difficulty of meeting the requirement of operation *before* danger is involved, and the use of the term *immediate* raises a somewhat similar consideration although not in exactly the same sense, because it implies instant response to fault conditions rather than anticipation. This can be achieved by the use of a suitable circuit-breaker but not, I think, by a fuse unless the value of the earth-fault current instantly exceeds the fuse rating by an amount which approximates to a short circuit.

REGULATION 21.—ELECTRICITY SPECIAL REGULATIONS 1908 AND 1944.

Where necessary to prevent danger, adequate precautions shall be taken either by earthing or by other suitable means to prevent any metal other than the conductor from becoming electrically charged.

Comparing this question of time in relation to earth-fault clearance with that previously referred to in connection with overload, it is apparent that the requirements as to earth-faults are more precise. Whilst the overheating which results from overload must be stopped before it is enough to cause danger, earth-faults must be cleared *immediately* without danger and this is also the general sense of the earthing Regulation No. 21. This latter Regulation is, however, clearly concerned with preventing danger from shock, as distinct from fire, a view supported by the fact that it is subject to Exemption 1, which means that it applies only when the voltage of the system exceeds 250 V d.c. or 125 V a.c. Thus the automatic protection provided under Regulation 8 for low voltage systems must achieve clearance of earth-faults, if they introduce danger of fire, without the assistance of an earth wire to carry the fault current away. If there is no fortuitous or chance earthing, the casings, conduit, sheathing or other metal work would stay live at voltages up to the value given, which some people might think to be hardly safe. If there is chance earthing then fault current, up to the value at which the automatic protective devices are set to operate, may flow in uncharted paths of unspecified resistance causing danger of fire. If this is to be prevented some form of automatic earth-fault protection in addition to that provided for overload seems to be legally required—a point which may not always be appreciated. In some cases I should think that systems of this low voltage type would be operating without intentional earthing of one point of the system. If, however, this condition is not preserved, two or more earth-faults might lead to "danger" if not cleared by the automatic protection.

The clauses devoted to earth-fault prevention in the Institution's Regulations refer to it as earth "leakage" thus following general custom. I do not think it a good term and I note that in Regulation 1006 an *earth leakage* protective device is required which will operate on the occurrence of an *earth-fault*. I am, however, concerned at this point only with a comparison of the Institution's requirements with those of the Statutory code under review and to this end I have considered the operating limits laid down for differential circuit-breakers in Note 3 to Regulation 1006. These are specified as 15% of the rated current for the circuit or 5 amperes, whichever is the greater. I do not feel sure that a fault current of up to, say, 15 amperes could be allowed from a circuit rated at 100 amperes without some risk of danger and thus I doubt whether these operating values would always meet the requirements of the Statutory Code.

Incidentally there is another point about Note 3 to I.E.E. Regulation 1006 which may be worth mention. The use of a differential type of protective device is expressed as *alternative* to one operated by rise in voltage but I think the two principles are so different from each other that they can hardly be regarded as alternative ways of achieving the same purpose. The voltage rise type of circuit-breaker is essentially designed to prevent electric shock whilst the differential or balanced current breaker is more in the nature of a safeguard against the risk of fire which may result from an earth-fault unaccompanied by appreciable rise of voltage on the premises protected. It is true that both forms of circuit-breaker may be regarded as alternative to the circuit overload protection, in the sense that they are expected to operate if the overload device does not, but the voltage type is dependent on a rise of pressure which is a secondary condition whereas the differential pattern is operated by the primary fault irrespective of the value or the position of any voltage rise resulting from it.

(To be concluded)

N.I.F.E.S.' First Year's Report

THE first Report of the work of the National Industrial Fuel Efficiency Service indicates a growing realisation among fuel consumers of the importance of efficient utilisation. The period covered by the report is from the formation of the Company on 2nd December to the end of the financial year on 31st March, 1955. As the initial part of this period was devoted to organisation and administration, the actual period during which field work has been carried out is limited to some 11 months, from May, 1954, to 31st March, 1955.

At the end of this period, N.I.F.E.S. had 151 engineers and 67 non-technical staff in its employ, and had opened offices in London and various provincial centres, and was in process of extending its activities to Northern Ireland. To present the services available to industry in a concise manner a brochure was prepared describing the four codes of service. These codes were summed up under the titles of (*a*) first-aid service; (*b*) operational improvement; (*c*) inspection in detail, and (*d*) full heat and power survey. Copies of the brochure were delivered to industrialists and the response was such as to threaten overwhelming of the staff. A thorough overhaul of methods was undertaken by the area managers and a simplified procedure worked out. It was found that a requirement for regular service agreements existed and some 70 of these have already been made. Multiple service agreements were also concluded with various public bodies.

First-aid services were provided to 5,525 factories and non-industrial establishments and 327 heat and power surveys were carried out. The purpose of 3·8% of the first-aid visits was specifically associated with dust or smoke emission, and in view of the complexity of this type of investigation an analysis is being made of cases presenting aspects of special interest.

Investigations have also been carried out on modernisation of power plant, operation of existing engines and turbines, bulk supply of process heat (for the C.E.A. at Warrington) and back-pressure generation. The percentage of engineering time occupied by heat and power surveys rose from 11% of the total in May, 1954, to 52·5% of the total in March, 1955. The major savings in this field were found to be in process plant, with boiler plant as a secondary.

Arrangements already in existence for collaboration between the Ministry's Fuel Efficiency Service and the industrial advisory services of the gas and electricity industries have been maintained. Close liaison has been established within the gas industry, and the work of the Electrical Development Association in promoting fuel efficiency is of particular importance.

The Report gives details of the arrangements which have been made for courses in fuel technology at technical colleges and universities, as well as of other educational facilities. Finally, details are given of the Government Loan Scheme for providing the necessary money for capital expenditure on fuel-saving equipment and modifications.

Fluorescent Lighting in Bankside Control Room

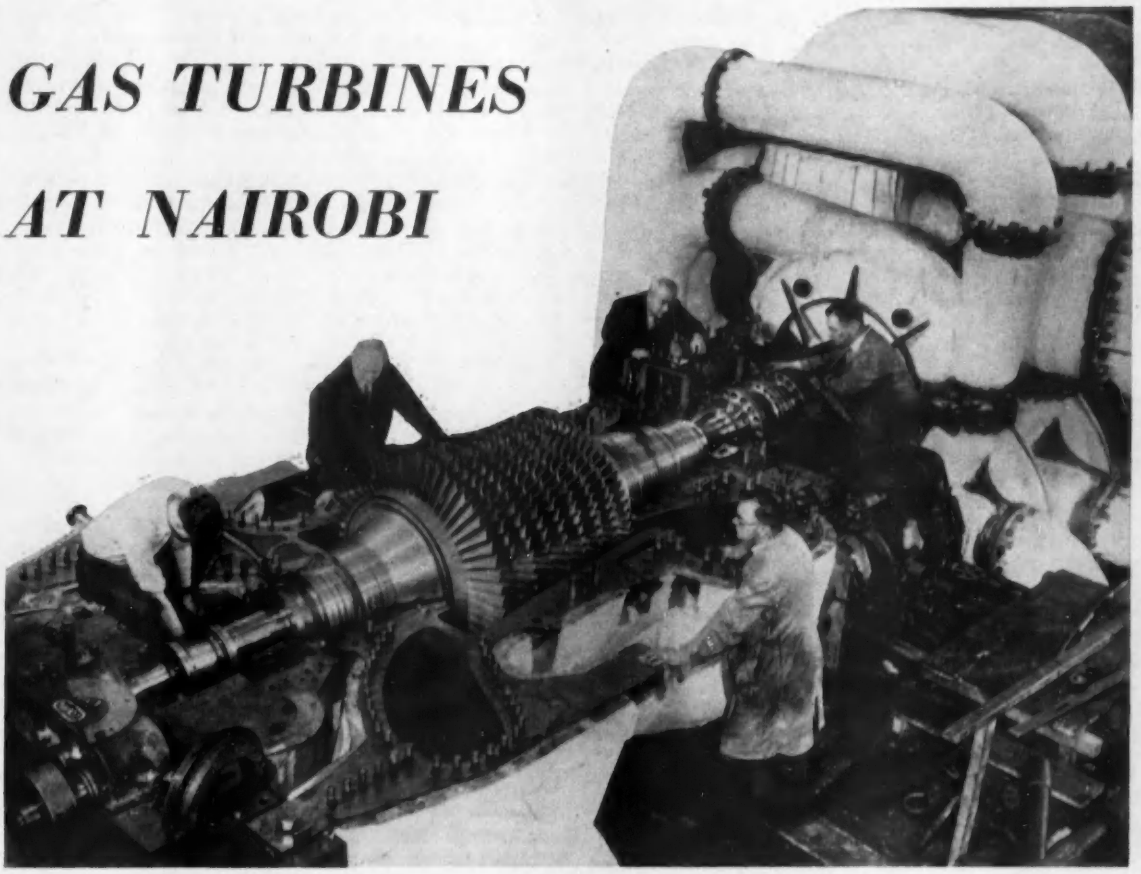
THE control room at Bankside "B" is laid out in a rectangular arrangement with a desk-type generator control board as the principal central feature. In front of this desk are the 66 kV control panels with portions of the 22 and 11 kV control boards at right angles forming the right and left sides. Behind the operators and making the fourth side of the rectangle are the 3 kV auxiliary board and the balance of the 22 and 11 kV panels. Behind the control boards are the associated relay boards with a suitable access passage left between them and the main boards. A certain amount of unused space is available, which will be filled when the remainder of the equipment is installed, the final arrangement consisting of some 74 Metropolitan-Vickers control panels and the same number of relay panels.

The main control room lighting, pertinently shown in the photograph is by Metrovick 5 ft fluorescent tubular lamps, for instant start operation. Additional filament lamps are used for emergency lighting. The three centre units consist of translucent material in extruded metal framework with a blown-plastic louvre in each centre panel. The step between the two ceiling levels is filled by a curved plastic coving which provides a high value of illumination without causing reflected glare from the glass of the instruments. Lighting behind the control boards is obtained from standard enclosed fluorescent fittings which have additional louvred sections at each end, concealing tungsten lamps for emergency lighting.

This power station, located on the south side of the River Thames opposite St. Paul's Cathedral, is fired by oil, and has been the centre of considerable controversy before and after its erection due to questions of amenity. The present installed capacity is 120 MW in two 60 MW sets. Steam pressure is 950 lb/sq. in., at 925° F.

Control room at Bankside power station showing Metropolitan-Vickers 66 and 11kV control boards and the same Company's lighting installation

GAS TURBINES AT NAIROBI



FIRST OF TWO 2,500 kW SETS ON COMMERCIAL LOAD

IN September 1954, the first of two 2,500 kW gas turbo-alternator sets was put into service at Nairobi South Power Station of the East African Power and Lighting Co., Ltd. The second set is now being erected on site. Both these machines were built by the British Thomson-Houston Co. to the order of Balfour Beatty and Co., Ltd.

When the sets were originally designed it was decided in view of the limited experience available to incorporate a centrifugal compressor. Later designs, however, will use axial compressors, and B.T.H. has now standardised on three sizes of gas-turbo-alternator sets for power generation, having nominal ratings of 2,500 kW, 4,000 kW and 6,000 kW. A fourth size of 10,000 kW is now being designed. These standard machines are single shaft sets with an alternator driven directly or through reducing gears as required.

The Nairobi Plant

At Nairobi, the machines supplied are open-cycle units with the compressor coupled in line with the turbine, the alternator being driven through a reduction gear box from the other end of the compressor shaft. The gearing gives a speed reduction from 3,500 r.p.m. to 1,500 r.p.m. for driving the salient-pole alternator which has a rated three-phase output of 3,125 kVA at 0·8 p.f. 10 kV, 50 c/s. A gear-type coupling is used between the compressor shaft and the high-speed pinion of the gear box.

Air for the compressor is drawn through viscous filters below the turbine floor level from the suction intake outside the building some 32 ft above ground level. After compression the air passes to a heat exchanger sited outside the power station building and then returns to a single combustion chamber mounted vertically beside the turbine casing. The products of combustion pass into the turbine from the combustion chamber and then exhaust through twin ducts to the heat exchanger and finally discharge into a chimney stack.

The turbine is designed for an inlet temperature of 1200° F and is a nine-stage machine. A Mitchell thrust bearing is incorporated between the compressor and turbine to take the difference between the two opposing thrusts. Welded construction has been used for the turbine rotor which is made up of three forgings in austenitic steel welded together to form the rotor barrel with a stub shaft (also in an austenitic steel) welded on at each end. Similar material is used for the turbine casings as well as for the turbine blading except in the first stage which is in "Nimonic."

Both ends of the turbine shaft are provided with labyrinth packing glands which are supplied with air at an intermediate point from the compressor exit so that a flow of cooling air is created outwards along the shaft. At the same time, a small quantity of air passes into the turbine and quite apart from assisting in keeping the turbine bearings cooled, this arrangement prevents any leakage of combustion products into the engine room.

The compressor is of the 4-stage centrifugal radial-flow type with backward-inclined vanes. The impellers are shrunk on and keyed to the shaft and are built up of vanes riveted to the impeller disc and to the shroud plate.

The diffuser system embodying Oerlikon patents Nos. 542468 and 558910 consists of four partial spirals connected to four straight conical diffusers for the transformation of kinetic energy into pressure energy at high efficiency. The four diffusers of each stage are cast integral with the top and bottom half of each casing with fabricated steel pipes connecting the outlet of each diffuser to the inlet passage of the next stage. The compression ratio is 4·5 to 1 and the throughput is 70,000 cu ft/min.

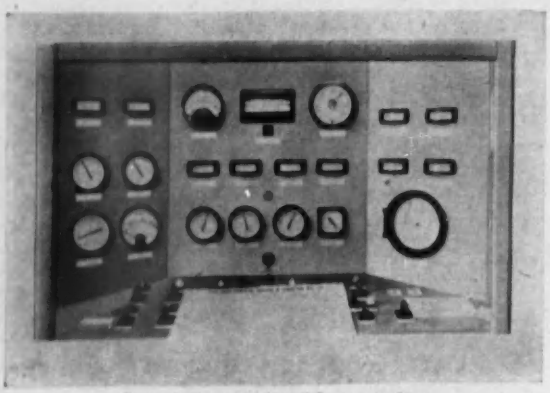
Combustion Chamber

The bottom part of the combustion chamber is bolted solidly to the bottom-half turbine casing but the weight of the chamber is carried on six springs at turbine floor level. Incoming air from the heat exchanger enters at the bottom and passes vertically upwards between the outer shell and the flame tube to the top of the chamber where the air divides into two flows. One of these enters the primary zone with the fuel and is used for combustion while the other flow is used for cooling the products of combustion. The combustion zone is refractory lined and the fuel oil is sprayed into the chamber through two main burners, the fuel flow being controlled by a lance operated from the governor system in the burner orifice.

The oil fuel is drawn from a ready-use tank through filters by duplicate 100% duty Hamworthy gear-type pumps which deliver the fuel through steam heaters to the combustion chamber at a pressure of 600 lb per sq in. gauge at a temperature of 200° F. The pumping and heating equipment was supplied by The British Combustion Equipment Ltd.

The output of the set is controlled by a speed governor regulating the supply of fuel oil to the combustion chamber through an oil-operated servo motor. The governor equipment is mounted between the turbine and compressor and is driven from the main turbine shaft through spur gearing. An extension from the governor shaft is also used to drive the main lubricating-oil pump. Oil for the governor servo system is provided by duplicate motor-driven Hamworthy gear-type pumps.

Starting and barring motors are mounted side by side on a baseplate at the exhaust end of the turbine. The barring motor rated 25-h.p. at 975 r.p.m. drives the main turbine shaft through a centrifugal clutch, a train of gears, and an oil-operated clutch. The starting motor with a 10-minute rating of 300 b.h.p. also drives the turbine through a train of gears and the same oil-operated clutch. There is no centrifugal clutch on the starting motor drive.



Gauge and control board for gas turbine

During the run-up, the barring motor is thrown out of engagement automatically when it is overdriven by the starting motor but it continues to run until the turbine has reached its self-maintaining speed and overdrives the starting motor. When this happens, the oil-operated clutch is thrown out of engagement and both the barring and starting motors are tripped out.

The heat exchanger is built up of four identical sections mounted on top of one another, this form of construction being adopted in order to facilitate transport and to simplify erection on site. The width is relatively narrow and both sides have doors for ease of access to clean the unit on the gas side. The heat exchanger was manufactured by Babcock and Wilcox Ltd., to B.T.H. design.

Starting Procedure

Starting the set is extremely easy. All the auxiliaries are operated from a 415 V a.c. supply, taken from the station switchboard, which is fed into a contactor cubicle housing the starting equipment for all the auxiliary motors.

When the isolators on the cubicle are closed, power is made available for the desk light, fuel flow recorder, the Selsyn equipment which indicates the position of the hand controller for the governor, and the photo-cells which operate when there is a flame in the combustion chamber. The fuel pump and control oil pump are started by a switch on the desk.

For starting, the hand controller on the control desk has to be in the "Oil-recirculation" position allowing fuel oil to be recirculated through all the burners in order to raise the temperature to that required for spraying. The ignition system, which comes into operation automatically at a later stage, can be checked for operation from the control desk by means of a test switch. This energises the power packs which, in turn, generate the high-tension spark. In addition, the switch energises a solenoid-operated oil valve which moves the igniters into the combustion chamber using the governor control oil pressure.

The next operation is to start the barring motor—again from the control desk. In actual operation the clutch solenoid is energised first and this allows the main clutch to be engaged under pressure of the lubricating oil from the auxiliary pump.

At this stage everything is ready for the turbine to be started automatically. This is done by operating the starting motor switch. Starting motor resistances are cut out in sequence automatically to increase the speed and at a predetermined point in the run-up the hand controller is operated automatically. As soon as the controller moves from the recirculation position, the igniters move into position and start to spark, the fuel recirculation valve closes, and the pilot burner commences to spray.

Automatic operation of the hand controller ceases when the turbine is running at a self-maintaining speed. At this point, the speed is increased by operation of the hand controller switch until it rises to the point where the governor takes over. Since the first machine went into service, the set has completed over 2,000 hours running on a boiler oil fuel (viscosity 550 seconds Redwood No. 1 at 100° F) supplying part of the requirements of the Nairobi power system, mainly during the three-month dry period.

Partly as a result of the success achieved with No. 1 machine, it was possible to complete comprehensive running tests on the second machine in the B.T.H. Rugby Works within nine days of it being handed over to the test engineers. During this period, 126 hours of light and load running were completed on a boiler fuel oil similar to that used in Nairobi; the set was not run on a distillate oil. It is believed that this short testing time is probably without parallel for gas turbines manufactured in this country.

From an engineer's notebook

PRINTED circuits, that fascinating technique which is now beginning to influence the design of radio sets, has unfortunately not yet fulfilled the more difficult role in power engineering that was optimistically forecast for it. Nevertheless, so inherently simple is it in concept that I was not surprised to learn of a new application in a wholly different field, a mechanical equivalent, as it were, of the electrical printed circuit. Here the idea is applied to the production of aluminium radiator tube stacks in a manner as original as printed circuitry itself. The tube pattern desired is printed in graphitic paint by the silk screen process on to one of two sheets of aluminium. The sheets are then welded together by hot and subsequently cold rolling until the final size is obtained. The purpose of the graphite printing is, of course, to prevent the welding of the aluminium at those parts where the tube is to be formed. After a final annealing, the tubing is formed by the simple expedient of hydraulic expansion; it is blown up much as the inner tube of a tyre, the pressure being applied through a hollow steel needle forced between plates at an unbonded section of the edge. In this way the most complex of tubing assemblies are possible and homogeneity of the structure, with the absence of joints assures such excellent thermal properties that the technique is suggested for such widely diverse requirements as refrigerator radiators and de-icers for aircraft. The real success of this method lies in the facility with which aluminium can be bonded to provide the necessary strength between the sheets. But however far this particular process may extend, I am quite sure we shall hear a deal more of printing techniques in engineering.

* * *

SIMPLE ideas always appeal to me even if their final application demands considerable complexity or, as I fear in the present case, may prove of doubtful practical value. Heat pumps are in the news, and surely this is the simplest of all heat pumps. The principle is based on setting up a vortex within a cavity by the tangential application of higher pressure air. Under the condition of high speed rotation the air at the circumferance is compressed and is consequently heated; correspondingly the air is expanded near the centre and is consequently cooled. Arrangements are made for bleeding off both the cold and heated air for use as required. I must confess to some surprise on learning that with air pressure at 60 lb/sq in., air temperatures were obtained of -20° C from the centre of the vortex with a circumferential outlet figure of $80-90^{\circ}$ C. The exhibit of this device at the Royal Society Conversazione was put forward with all humility as no more than an apparatus for small cooling jobs where an ordinary refrigerator would be unnecessarily elaborate. Unfortunately insufficient data were given to permit the assessment of wider possibilities, but experimental figuring on a few guesses I made are not encouraging. A pity, for it is an attractive idea, in pleasant contrast to the many complexities with which we have to bear.

OF the many fields of activity of the electrical industry I am always particularly proud of its contributions to medical science. From galvanic currents and diathermy to electric shock therapy and electroencephalography, electricity is providing many of the tools of modern medical practice. Yet as someone outside this spectacular field I have the impression that the liason between these two spheres of interest is extremely limited and is largely dependent upon a few enthusiasts in the medical profession. Whether electricity has more to offer is something only time can tell but a simple example of what can be achieved by combined approach is seen in the development of a new type of artificial eye which, with nothing more complex than two magnets, enables a surgeon to provide an eye which will have the movement of the living organ. This utilises an implant of clear non-irritating plastic which is buried in the eye socket with the muscles of the removed eye attached. This implant contains a permanent magnet matching a corresponding magnet in the artificial eye itself and by this means it is stated that not only is movement of the eye obtained but its weight is removed from straining the lower lid.

* * *

FOR some years now work has been proceeding on the replacement of Father Time's hour glass with an instrument more appropriate to the atomic age and it is from the Massachusetts Institue of Technology that the first claim comes of the development of an atomic clock to a stage where commercial production can be contemplated. The basic idea of utilising the resonance of a caesium atom for time measurement is not new and our own N.P.L., over the last two years, has been making considerable progress in utilising this principle. The outstanding characteristic of such a clock is the extreme accuracy possible and errors within one part in one thousand million are said to be obtained. Such accuracies will open up new possibilities in geophysics and astronomy and enabling minute changes in the movement of astral bodies to be detected, as well as providing an accurate frequency standard. Basically the principle of the atomic clock is simplicity itself. It consists of no more than a small quantity of caesium, heated to a moderate temperature until it emits a stream of atoms. Each atom acts as transmitting agent, the radiation frequency of some 9,192 megacycles a second being determined and maintained by cyclic variations of the electrons in their orbits round the caesium nucleus. The difficulty lies in measuring the frequency of the radiation from each emitted atom after it has been detected at a screen. It is here that complications are introduced and our simple clock ends up as a rather voluminous affair, specified rather crudely in the report I have read, as about the size of two grandfather clocks, as though this object of veneration in our halls has now become a standard of volume rather than time. Size however is a small price to pay for such exact standards, particularly when one considers the size and care that must be taken of existing time standards in our observatories.—*E. R. G.*

Plastics on show

THIRD BIENNIAL EXHIBITION AT OLYMPIA

ILLUSTRATES ADVANCES IN TECHNIQUE

THE British Plastics Exhibition organised by the journal *British Plastics* is now staged for the third time with the encouragement and blessing of the British Plastics Federation. In our report of the second show we noted a return to popularity of plastics in the fabrication of both industrial and domestic equipment. It would be fair to say that this young and vigorous industry has made such rapid progress, both in the development of new materials and in new applications, that industry would be hard pressed to find substitutes of any value now for the methods and materials which themselves fought a hard battle for acceptance.

Generally speaking the exhibition is on the same lines as its predecessors, but this year has probably a greater appeal to the public. Over a hundred and twenty firms are represented in the three divisions—finished products, plant and equipment and materials.

Materials

Into this latter category comes Tufnol, a material which will be familiar to many of our readers for it combines mechanical strength with excellent electrical insulating properties. Amongst the variety of parts and components machined or moulded to shape during manufacture is a display of Tufnol gear wheels ranging from small gears for instruments to pinions for transmitting heavy loads. A display of electrical insulators and punchings exemplifies the second great property of Tufnol.

Three separate displays form the exhibit of BX Plastics, Velbex flexible vinyl sheeting for curtaining and rainwear, Cobex rigid vinyl sheet or block—non-inflammable and tough, and Bextrene the polstyrene moulding powder, which is now available in a number of new pearl shades. Most interesting in this display is the "Lumex" fluorescent lighting diffuser screen and the refrigerator tray mouldings.

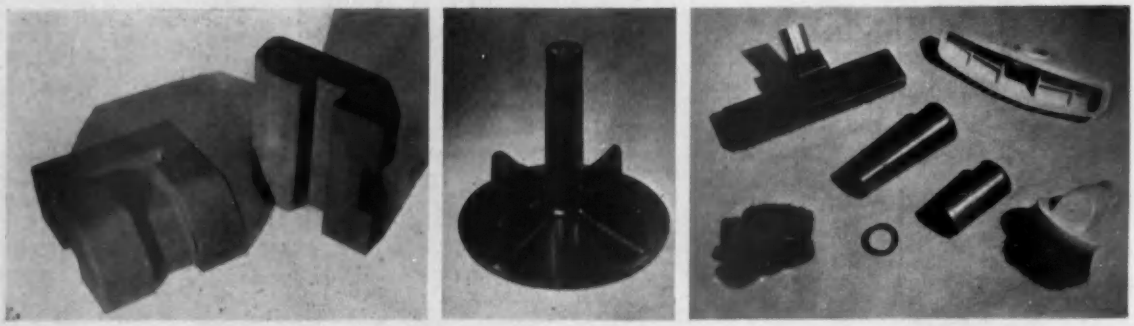
"Leave it to Lorival" say the advertisements and to judge from the variety of exhibits on this stand many people have been glad to take advantage of the firm's comprehensive production and design versatility. Examples of current output include washing machine agitators in phenolic materials and hard rubber battery containers for traction batteries. For miniature radio equipment there is a range of high impact polystyrene cells.

A testimony to the acceptance of plastics as a whole and to the long existence as plastics specialists of the company is the use by the uninitiated of the trade name "Bakelite" as a synonym for "plastic." Interesting feature of the exhibit is the display of mouldings in the newly-developed alkyd materials which possess very fine electrical properties, can be either fast curing or used in standard plant and can be produced in both bright and pastel colours. Equally important are the assemblies based on circuits printed on Bakelite copper-clad laminated sheet. The "Lumenated" ceiling by a firm of the same name which forms part of the island canopy employs corrugated Vybak sheet, a Bakelite product, suspended below fluorescent and tungsten lamps to provide a glareless illuminated ceiling.

The Distillers group companies, British Geon, British Resin Products, and Distrene, have a joint stand which offers much of interest to the engineer. The British Geon display is based on the theme "Plastic in the Mines" and has a selection of mining cables insulated and sheathed with Geon p.v.c. Electrical accessories moulded in Rockite phenolic moulding materials are featured by British Resin Products, whilst the Distrene display on "Plastics in the Home" includes T.V., radio and record player employing "Styron" Polystyrene with the latest Atlas louvred ceiling lighting in the kitchen.

The installation of new plant has prompted The Telegraph Construction and Maintenance Co., Ltd., to feature "Telcothene" coated papers and boards up to 72 in. in width. Short demonstrations are given showing versatility and ease of application of Telcothene Powder to metal objects of irregular shape. Telcohesive jointing tape and Telcompound for joint box filling are also displayed.

The Monsanto Plastics exhibit features Lustrex Polystyrene moulding materials in several grades including Lustrex "Hi-flow 55," a fast-flowing polystyrene for intricate mouldings needing a long flow. Lutrex "Toughened 1," a toughened polystyrene, is also featured in the display which includes moulded products of interest to many industries.



Left to right: Tufnol insulators for supporting live rails on electric railways. One of the many examples of current Lorival plastics output is this washing machine agitator in phenolic material. These cleaner parts for Vactric and Hoover cleaners are produced in Bakelite's Vybak compounds. The mouldings are by British Moulded Plastics Ltd., E. K. Cole Ltd. and J. F. Kenure Ltd.

The Permanoid display includes the products of Permanoid Ltd. and two associated companies, Arrel Electrical Accessories and Briggs and Townsend. The first company is showing a range of plastic-insulated wires and cables including high temperature leads insulated with Permanoid VO grade material suitable for use at temperatures up to 150° C. This material uses Diolpate plasticiser. Samples of a coaxial cable using expanded polythene as dielectric are also featured. Arrel Accessories have displays of moulded insulators for television aerials, coaxial plugs and sockets and Briggs and Townsend are showing their plasticiser. Diolpate which can be used with p.v.c. compounds, nitrocellulose and synthetic rubbers, and is used in the making of cable coverings, wrapping papers, etc.

Ashdowns Ltd. include in their display examples of plastic mouldings and extrusions, Ashlam S.R.B. paper mouldings for refrigerators and similar applications, Ashlam S.R.B. boards for electrical insulation and a number of copper-clad laminates.

The Ekco organisation has had 24 years' experience of moulding work and has achieved an enviable skill in intricate moulding operations, and on display has a selective range of compression and injection mouldings. These include parts for use in refrigerators, electrical equipment and radio receivers.

Fibreglass materials for plastics reinforcement are shown by Fibreglass Ltd. together with examples of the end products employing the new material. Its employment in car bodies, vans and buses, in aircraft and boat hulls is being rapidly expanded, and the stand shows some of the multitude of applications. Shell Chemicals are making a main feature of their "Epikote" resins which are now in production use in casting and laminating work in the electrical, aircraft and chemical industries. These resins and examples of their usage are featured.

National Plastics (Sales) Ltd., which is the selling organisation of British Moulded Plastics, have an exhibit which emphasises the large-scale production of which the Walthamstow factory is capable. Particular technical interest is evinced in the articles moulded by the preform method from reinforced resin glass material and in components made from nylon. There are safety goggles in flexible p.v.c., extrusions from clear polystyrene and many articles moulded in hard rubber.

Turner Brothers Asbestos Co., Ltd., has a display showing the usage of the company's "Duraglas" materials which include cloth, tapes, rovings, sleevings and cords in aircraft, automobile and boat building. Durestos resinated asbestos felt and flock moulding materials are used in high and low pressure mouldings on show.

More than two and a half million mouldings are produced each week by the General Electric Co. who use ten different plastic materials. Examples of these products include cases and cabinets for use in the electrical and radio industries, various components for household appliances, switches, etc. The scope of the company's plastics activities is exemplified by the contrast between nylon studs for football boots, and a right-angle torch in cellulose acetate which has been adopted for use by the Services, the police and N.A.T.O. Forces.

Plant and Equipment

The new "Mini-Welder" specially designed for finishing work on plastic garments and a giant 30-ton press capable of embossing and welding bench-type seat upholstery for cars and coaches in a rapid single-shot operation, are two of the many important exhibits to be seen on the Redifon stand. In addition to jig welders and plastic pre-heaters, an advanced new table-type welder, new heavy presses and a novel welding applicator providing speedy means of p.v.c. packaging, are displayed.

In the field of high vacuum equipment the W. Edwards and Co. display is interesting with the large "Formvac" vacuum-forming machine, Model 2G5, which the firm are now making under licence from the Swiss firm of Hydro-Chemie. In addition, two of the latest vacuum-coating units the model 36EA and the continuous roll vacuum-coating plant, model 24CE, for the deposition of thin films of metals on a continuous roll of material are shown.

Starting Plugs for Gas Turbines

EARLY in his experiments into jet propulsion, Sir Frank Whittle came up against the plumber's problem of "lighting his blowlamp." A solution was found in the use of a sparking plug with a slightly longer reach than normal, and having a high tension spark that would ignite paraffin.

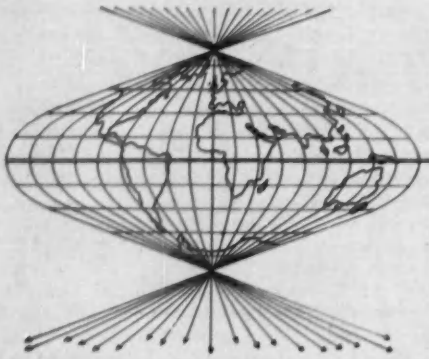
This plug proved satisfactory in certain jet engines, notably the Goblin and Proteus. It is, however, not capable of lighting all engines, largely because of the spray pattern of the burner. As with piston engine plugs, the jet plug is sited as near as possible to the incoming fuel mixture but as far as possible from the resultant heat. Nevertheless with flame temperatures in the region of 2,000° C, the electrodes in the coolest position must be of high temperature steel or nickel alloy.

The search for an efficient igniter continued, and a combined spray and igniter system was developed which consisted of a flanged unit with a protective skirt embodying a subsidiary spray jet and a high tension igniter in the centre. An atomised jet of paraffin from the auxiliary spray is blown across the sparking point and ignited to give a balloon of flame reaching into the main burner spray. This igniter system could be located in a relatively cool position.

Both these igniters still suffered from unreliability at great heights or at high speed where the air temperatures are low. The research and development department at K.L.G. sparking plugs produced the high energy igniter which had an inner and outer electrode with only the operating tip exposed. This was treated with colloidal graphite to provide a "leaky" path and instead of the normal h.t. of 12 kV, a voltage of 2,000 was found ample, backed by a considerable condenser storage capacity. When tested in the open, the discharge across the points sounds similar to a rifle shot, and the energy dissipated is about 250 times as great as that of the normal type of high tension sparking plug.

There still remained one major difficulty: in the course of time the "leaky path" burned off, and the plug then refused to fire. Many variants of surface coating were tried, and production of a really reliable high energy igniter was held up for a considerable time. Finally a successful coating was developed which is in the nature of a semi-conductor and is fused on to the insulating material between the electrodes.

On test, the TS 1018 high energy igniter has withstood the highest temperatures experienced in jet engines. More than 143,000 sparks have been transmitted across the coating material without any breakdown in physical or chemical composition. The new igniter is now coming into use on most British jet engines, either in the main combustion chambers or in the re-heat sections.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Quebec's New Project

More steps in the remarkable industrial expansion in Quebec were referred to last weekend by Mr Duplessis, the Province's Premier. These include another hydro-electric plant on the Chicoutimi River, which is estimated to cost $4,750,000, and a $20 millions copper refinery at Chicoutimi.

Yukon Scheme

The feasability of a large power development in Northern British Columbia and in the Southern Yukon has been confirmed by Northwest Power Industries Ltd., an associated firm of Ventures Ltd., who conducted field surveys and engineering studies in the territory last year. It is now stated that these investigations have entirely confirmed the feasibility of the tentative plans earlier developed. The scheme, as now conceived, envisages diversion of the waters of the Yukon watershed by means of dams into natural storage basins at elevations above 2,000 ft. It now has been shown definitely that a minimum of 4,300,000 h.p. could be developed in stages at two sites between the south end of Atlin Lake and the Taku River with the further possibility that an additional 500,000 h.p. could be economically developed on the Taku River itself. The company adds that the water reserves thus created would then be available to maintain a consistently large uniform flow out of Atlin Lake through rock tunnels to generating stations in the Taku River valley below.

Views on B.C. Water

Hydro development on the Columbia River was the subject of statements expressing opposing view points, at the Pacific Northwest Trade Association Convention last month. The Canadian Natural Resources Minister, Mr J. Lesage, said the export from British Columbia of water for development of hydro power in the United States was a tempting proposition which held dangerous implications. The Canadian Government had always thought that her natural resources should be exploited to the best advantage of the country. She could not be expected to make hydro power available outside the country on terms which would hinder her own industrial progress. If British Columbia experienced a normal rate of growth in the next two or three decades all of her cheap sources of power would be required at home. In the case of future projects on the Columbia River, the Minister indicated that Canada would not agree unless upstream areas received an adequate and fair share of the resultant power generated downstream. Putting an opposing view, Mr L. Jordan, chairman of the U.S. section of the International Joint Commission, said Canadian proposals to divert the Kootenay and Columbia Rivers to increase British Columbia's hydro power supply would seriously jeopardise large American projects such as Grand Coulee, Chief Joseph, the Dalles and other dams on the lower Columbia.

Plant for Ontario

The first nuclear power plant for Canada is to be built at Des Joachims, on the Ottawa River, Dr Richard L. Hearn, chairman of the Hydro Electric Power Commission of Ontario, stated last weekend. The estimated cost of this pilot plant, which will have a generating capacity of 20,000 kW, will be over $13 millions.

U.S.A.

Pumping Coal

Coal is to be pumped 108 miles through a pipeline across Ohio from mines near Pittsburg to a power station in Cleveland, it is reported. The coal will be crushed into small pieces at the Pittsburg mines and then fed with water into the pipeline. Pumping stations will send it along, and at the end the water will be drained off and the coal stored for use, we understand. Agreement has been reached between the power company and the colliery for the delivery of over a million tons of coal annually by this method for fifteen years. Work is to be started soon on the construction of the pipeline, which is estimated to cost over $8 millions.

SCANDINAVIA

Power Exports

After prolonged negotiations, Norwegian and Swedish officials have reached agreement on proposals for the export of power from a hydro-electric plant at Nea, near Trondheim in Norway, to Stockholm, in Sweden. The agreement, which is to cover a period of fifteen years, is between the Trondheim and Stockholm municipalities, but is still subject to the approval of the Norwegian Parliament and the authorities in Sweden. The latter earlier signified their acceptance in principle, but at that time the Norwegian Storting decided to leave the matter in abeyance pending further discussion by the Governments concerned about the whole proposal for joint Scandinavian development of Norway's hydro power resources. Under this new agreement, Stockholm will receive about 300 million units annually from the Norwegian power station, the price per unit being on a sliding scale with a maximum of 2·9 Swedish öre (equivalent to just under ¼d.) in winter. One condition of the agreement is that Trondheim City Authorities are to receive a Swedish loan of about 64 million Swedish kroner (£4,400,000) towards the construction of the new power station on the Nea River.

EUROPE

More Plant

Another record is about to be set up in Hungary—the biggest water turbine made in that country, of 4,000 kW capacity, is nearing completion at the Ganz Wagon turbine factory. Weighing 400 tons, this is the first of three such machines which are to be installed at the new Tiszalok hydro-electric plant (to which we referred on 3 Feb. last). We also have news that the second of six steam turbo-alternators being installed at the Borsod power station at Berente, north east Hungary, was put on load a few days ago. This station is supplying the large industrial area now being developed in the Sajo valley.

Loan for Development

For the further development of Southern Italy, the World Bank has made a loan in various currencies equivalent to $70 millions—the largest development loan that the Bank has ever made in Europe. Formally the new loan is allocated to the Catania irrigation project in Sicily, and to 15 industrial and power projects in Sicily and on the mainland

of Southern Italy. The loan is being made to a governmental agency who will advance $30 millions of it towards the construction of seven power stations and the erection of a transmission line on the mainland. These are projects of three companies which, between them, serve almost all southern Italy, apart from the region around Rome. The new project will add about 224,300 kW to their installed capacity, and increase the annual output by 740 million units.

AFRICA

Scheme for Tanganyika

The main recommendations in a consulting engineer's report on the matter of electricity supplies in Tanganyika have been accepted by that Government. Accordingly, negotiations have been reopened with the two power companies operating in Tanganyika—the Dar es Salaam and District Electric Supply Co., and the Tanganyika Electric Supply Co. —with a view to their amalgamation within a year, we understand. The government's attitude, it seems, is that if new terms on these lines can be agreed, an amended licence will be issued to the operating company. The suggestion has also been made that electricity supplies could be transmitted to Dar es Salaam from the existing and projected hydro-electric stations on the Pangani River. It has been stated that the Tanganyika Electric Supply Co. Ltd. is in the course of preparing a programme of development, but details are not yet available.

PAKISTAN

Changes at Karachi

The Karachi Electric Supply Corporation is to convert its steam generating plant to use Sui natural gas instead of the present oil fuel, Mr C. D'Cruz, manager of the undertaking has stated. An agreement has been entered into with the Sui Gas Transmission Co. for the supply of Sui gas to the Corporation whose power stations will be using only that form of fuel by Aug. next. Until Mar., 1956, the monthly consumption of the gas will be about 100 million cu ft, but when two new 15 MW turbo-generators go into commission next Mar., the consumption will reach about 300 million cu ft a month. (Price of the gas has been given as Rs. 1, 12 annas per 1,000 cu ft.) Mr D'Cruz also stated that application had been made to the Pakistan Government for permission to install a further 45 MW of generating plant, made up of three 15 MW sets, following the recommendations of the consulting engineers, Brian Colquhoun and Partners. The oil-burning equipment is being retained for all the plant as a standby. Indicating the increase in load, he said that at Partition the undertaking had 18,000 consumers, but the number was now over 42,000.

Power Surveys

The two firms of foreign consulting engineers appointed to conduct a survey of the total power resources and requirements of West and East Pakistan for the next ten years have now submitted their reports to the Pakistan Government. The firms concerned are International Engineering Co., and H. G. Acres and Co. The Pakistan Government is also considering proposals for the formation of two autonomous bodies for East and West Pakistan charged with the responsibility of development of power resources and irrigation projects. We have already reported the suggestion for the setting up of an Electricity Commission.

AUSTRALIA

Higher Tariffs Wanted

The Hydro-Electric Commission of Tasmania has asked for permission to increase electricity charges by 25%, for it considers that the greatly increased annual capital charges can only be met by higher tariffs, it is revealed in the Commission's annual report recently tabled in the House of Assembly. The State Premier, Mr Cosgrove, has since said that the increase has not been approved as the Government felt the Commission should first examine the low rates charged to firms with big contracts, and also see if savings could be made in other directions. The report shows that during the year ended 30 June last, the major bulk industries took 709·8 million units, while retail consumers accounted for 486·2 millions. Total number of consumers at 30 June was 97,450, an increase of 4,343 during the year. Income for the year was £3,112,300 —£669,278 more than in the previous period — but working expenses were 14% up. The surplus of £41,583 is a reduction of £103,096 on the figure of the previous year. In his accompanying report, the Auditor-General points out that the Commission is in a difficult position in that unproductive works—that is, those under construction—were costing two-thirds as much as the amount already spent on works which were producing revenue (£21,740,000 as against £31,020,00).

Acquisition

Our note last week concerning the possibility of the General Electric Co. of America reinvesting in Australia contained an unfortunate slip. The shares it formerly held in the Australian General Electric were acquired earlier this year by Associated Electrical Industries Ltd., not the G.E.C. of England, as stated.

FAR EAST

Submarine Cable Anniversary

The 75th anniversary of the laying of the Hong Kong-Philippines submarine cable was recently celebrated in Manila. This cable was made by the Telegraph Construction and Maintenance Co., Ltd., and laid by the c.s. *Calabria*. It will be recalled that Telcon and Siemens Bros. and Co., Ltd., amalgamated their submarine cable interests in 1935 to form Submarine Cables Ltd.

The British Columbia Power Commission recently put into operation its new 24,000 kW hydro-electric development on the Puntledge River, Vancouver Island, illustrated alongside. A single Francis-type turbine, direct connected to a 60 cycle vertical generator, utilises a head of 340 ft. The station is being operated as a base-load plant, remotely controlled from the John Hart development at Campbell River. With additional water storage, the Puntledge plant could be extended, and studies on this subject are continuing although there is no immediate plan for the construction of a second stage. The new plant replaces the 12,000 h.p. 25 cycle station which was built in 1913 by Canadian Collieries Ltd. Formerly, water from the old flume and pipeline fed two 6,000 h.p. reaction-type turbines each driving a 25 cycle generator. To continue to provide the colliery with 25 cycle power, the original turbines have been replaced by 60 cycle synchronous motors which drive the old generators

Personalities

IN THE INDUSTRY

After 36 years' service with the Dubilier Condenser Co. (1925) Ltd., **Mr F. W. Hollings** has retired from the position as secretary, and he has been appointed a director of the company. His successor as secretary of the company is **Mr H. S. Clemow.**

Appointed as the new advertising and publicity manager of the Simplex Electric Co., Ltd., is **Mr Geoffrey Stenning,** M.I.A.M.A., ASS.I.P.R. He will be based at the company's London office. From 1952/54 Mr Stenning was with the Brush Group where he held the positions of group publicity officer and editor of the technical journal. Before joining the Brush group he was with Technical Designs Ltd. for a period after his return from Canada where he spent twelve months as assistant public relations officer to Avro Canada Ltd. Before going to Canada he was connected with B.O.A.C. and the Bristol Aeroplane Co., Ltd., as an electrical inspector.

Mr D. P. Welman, M.I.MECH.E., A.M.I.E.E., has been reappointed as a member and chairman of the North Western Gas Board.

Mr C. S. Wheeler, M.S.M.A., managing director of Wheeler Electrical Supplies (Wholesale) Ltd., has been elected president of the Derby Electrical Society for the forthcoming session.

Thorn Electrical Industries Ltd. (Atlas Lighting Division) announce that **Mr M. Baskeyfield** has been transferred to Cardiff as South Western area sales manager in succession to **Mr J. Duffield** who has been transferred to Birmingham as Midlands area sales manager, both appointments taking effect immediately.

Newly-elected president for the coming year of Stamford (Lincs) Rotary Club is **Mr Sydney Hutchinson,** assistant manager of the Stamford district, East Midlands Electricity Board. Starting as an apprentice with a firm of electrical contractors at Boston, Lincs, his home town, Mr Hutchinson was with various electricity undertakings until nationalisation.

The new chief commercial officer of the Eastern Electricity Board is to be **Mr R. H. M. Barkham,** B.SC.(ENG.), M.I.E.E., F.R.S.A., who is now manager of the Board's Essex sub-area. He succeeds **Mr E. A. Fowler,** M.I.E.E., F.I.E.S., who, as we exclusively reported on 28 Apr., is joining the headquarters staff of the General Electric Co., Ltd. Mr Barkham, who takes up his new duties on 1 Aug., has been manager of the Essex sub-area since 1948, and was previously manager of the Grantham undertaking of the Urban Electric Supply Co. for five years, during which time he also controlled three other concerns in the Edmundson's group. Earlier he had served with the East Anglian Electric Supply Co., at Stowmarket, for a period as personal assistant to the managing director. Born at Wickford, Essex, Mr Barkham gained early training with Crompton and Co., and joined the East Anglian Electric Supply Co., Ltd., in 1931.

The new assistant manager of the Sheffield district office of British Thomson-Houston Co., Ltd., is **Mr K. J. Clarke,** A.M.I.E.E., who has been at Sheffield since 1953. After completing an engineering apprenticeship at B.T.H. Coventry Works in 1931 Mr. Clarke was given a staff appointment in the Industrial Machines Department at Rugby, and in the three years following gained experience in industrial motor applications. In 1936 he was posted to the company's Birmingham district office, with particular responsibility for the East Midlands territory. In 1942 he returned to Coventry works for special duties associated with war production, rejoining Birmingham office in 1944, since when he has specialised on electrical equipment for the steel and mining industries: he is a member of the Association of Mining Electrical and Mechanical Engineers.

Our photograph below shows **Mr Willard C. Brown,** of the General Electric Company of America, with **Mr C. W. M. Phillips,** manager of the B.T.H. Lighting Department. Mr Brown visited

Mr W. C. Brown, left, with Mr C. W. M. Phillips

London last week, to give an interesting talk on current American lighting practice to a gathering of B.T.H. engineers. He is on his way to attend the ten-day International Commission on Illumination (Commission Internationale de l'Eclairage) at Zurich, which begins next Monday. An internationally known figure in lighting circles, Mr. Brown is a past president of the I.E.S. of America and executive vice-president of the Cleveland Engineering Society.

Mrs D. Burdes, M.P.S., has been appointed organiser for the South Western Area of the Electrical Association for Women. She is a member and former chairman of the Bristol and District Branch.

Mr R. B. Stucke, a senior assistant engineer (civil) to the London Division of the C.E.A., at Woolwich generating station, has been appointed as the new leader of Woolwich Borough Council. He has been a member of the council for six years.

Mr G. Stenning

Mr M. Baskeyfield

Mr J. Duffield

Mr R. H. M. Barkham

Mr K. J. Clarke

Mr A. Sutherland, A.H.-W.C., A.M.I.E.E., has joined Watson-Norie Ltd. as managing director. He gained his technical education at the Heriot-Watson College, Edinburgh, and served a full apprenticeship with Bruce Peebles and Co., Ltd., followed by experience in their machine testing departments. Further experience was gained at J. Brown and Co., Clydebank, the Grampian Electricity Supply Co., and Pyrotenax Ltd. During the war he served with the Admiralty, and has had many years in the Electrical Contracting Industry. He is a member of the Engineers' Guild and the Iron and Steel Institute.

Mr A. Sutherland

Councillor B. C. Elliott

Works manager of C. H. Blackburn and Co., Ltd., **Councillor B. C. Elliott,** is the new Mayor of Calne, Wilts. During the war Councillor Elliott served with the R.A.F., originally as an instructor in "R.D.F.," but later he was attached to the Medical Branch for research into the problem of interference with radar by electro-medical equipment. On his release from the R.A.F. in 1946, F/Lt. Elliott joined C. H. Blackburn and Co., Ltd. Their London factory having been "blitzed" that company moved to Calne where the present factory was opened in May 1947. Mr Elliott was first elected to Calne Borough Council in 1950 and he now takes office as Mayor in an interesting year, since 1955 is Calne's historical millennium. The town was first mentioned in recorded history in the will of the Saxon King Edred in the year 955.

The Central Electricity Authority have appointed **Mr Gerald B. Jackson,** D.F.H., to be power circuit engineer in the Chief Engineer's Department at Headquarters. Mr Jackson completed a course at Faraday House before joining the former Central Electricity Board in the Mid-East England Area. After serving during the war with the Royal Engineers on Bomb Disposal work he returned to the Central Electricity Board, and after vesting date continued on transmission work in the Yorkshire Division of the Authority. For the last four years, he has been in charge of transmission construction work in the Division.

Deputy station superintendent at Coventry power station, East Midlands Division, C.E.A., **Mr E. G. Spilling,** A.M.I.E.E., has been appointed to a similar position at the Westwood power station, North West, Merseyside and North Wales Division. He went to Coventry in Dec., 1948, having earlier served at Portishead and Portsmouth.

Mr J. Arthur Savoie has been appointed chairman of the Quebec Hydro-Electric Commission, in succession to **Mr L. E. Potvin** who retired at the beginning of this month.

OBITUARY

Mr R. M. Gillies, who retired from the managership of the London office of G. and J. Weir Ltd. in Dec. 1947, died recently.

M André Claude, a director of Claude-General Neon Lights Ltd., died in Paris on 13 May, aged 55. He was well known throughout the lighting world, being a past president of L'Association Francaise des Eclairagistes, chairman of Les Etablissements Claude Paz et Silva of Paris, a director of "L'Air Liquide," and an Officer of the Légion D'Honneur.

Mr Ronald Grierson, M.I.E.E., M.I.MECH.E., who retired from the position of heating engineer to the Eastern Electricity Board in 1952, died on 5 June, aged 69. He was prominently known for his active interest in space warming, ventilation and electrical installation matters and will be greatly missed by a wide circle of friends. Mr Grierson gained early practical training in the municipal power stations at Mansfield, Rochdale and Poplar, after studying at the University of Birmingham. Later he did some pioneering work relating to electrical and mechanical equipment for larger theatres and film studios, including work in association with Commander Haydn T. Harrison on projection arcs. Following war service he was managing director of Grierson Ltd. from 1922 to 1935, during which time he was responsible for many important electrical installations. Also, in association with Richard Crittall and Co., he was responsible for a number of electric thermal storage installations. In 1936 he joined the Northmet Power Co. as heating engineer, and continued in that position with the Eastern Electricity Board. Mr Grierson was chairman of the I.E.E. Installations Section in 1942-43, was a past-member of the Councils of the I.E.E., E.D.A. and I.H. and V.E., apart from serving on numerous committees. He was also the author of various books on ventilation, electric lifts and domestic water heating, in addition to technical papers on similar matters. The funeral is at Golders Green Crematorium today, at 2 p.m.

Mr R. Grierson

Mr W. Gilbert, chief electrical engineer to Ransomes, Sims and Jefferies Ltd., who was recently appointed deputy chairman of the Eastern Electricity Consultative Council, died on 2 June, aged 62. He received early training at Northampton Polytechnic Institute, and for some time was design engineer to the Sunderland Forge Co. He had been chief electrical engineer to Ransomes, Sims and Jefferies for over 30 years. He was also a member of the Ipswich and District Electrical Association.

Mr A. B. Wishart, general manager and a director of Belling and Co., Ltd., whose death we exclusively reported last week, joined Belling's in 1935 as general manager. Earlier he had been assistant sales manager in the Mazda Lamp Department of the British Thomson-Houston Co. after being in business on his own account in Glasgow for some years. Educated at Glasgow Academy and Glasgow University, Mr Wishart was 62 years of age, and will be greatly missed by many in the industry.

BRITISH STANDARDS

Solid drawn copper alloy tubes for the manufacture of screwed ferrules and copper alloy screwed ferrules for condenser, evaporator, heater and cooler tubes. *B.S. 2579: 1955. Price 2s. 6d.* To cover the gap left by the part of B.S.378: 1941 omitted when the 1953 edition of that standard was published, comes this new British Standard. It will be recalled that B.S. 387: 1953 specified requirements for five alloys from which condenser tubes can be made. These same five alloys are included in B.S. 2579, for the manufacture of screwed ferrules and the ferrules themselves. Of these five alloys, two—70/30 brass and 70/29/1 (Admiralty mixture) brass—were included in the 1941 edition of B.S. 378. The three new alloys of aluminium brass, copper nickel and aluminium bronze (7% aluminium), are now included.

X-Ray Protective Gloves for Medical Diagnostic Purposes up to 100 kV Peak. *B.S. 2606:1955, Price 2s. 6d.* Specifies requirements for flexible "lead-rubber" gloves for medical diagnostic purposes, intended to give a measure of protection to the hands and forearms of the operator when working with X-rays excited at voltages up to 100 kV peak. The standard gives general dimensions of three sizes of gloves which may be either wrist length or gauntlet. The protective and mechanical properties of glove materials are specified together with requirements concerning manufacture and workmanship. Particular attention is given to the necessity for frequent inspection.

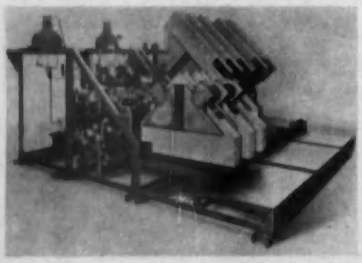
Copies of the above Standards may be obtained from the British Standards Institution, 2 Park St, W.1, at the prices stated.

Equipment for Industry

G.E.C.'s Air-break Reverser

DESIGNED for the frequent reversing duty required in colliery winder service is an 11 kV air-break stator reversing contactor recently introduced by the GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2, as an addition to its range of such equipment which previously included only units for 3·3 kV and 6·6 kV operation. Generally similar in appearance to the earlier lower voltage equipment, it comprises the two triple-pole units required for normal reversing service, together with an additional two-pole unit for the dynamic braking circuit.

To minimise dust collection, and its consequent danger of tracking, vertically-mounted steel bars are used to support the individual phase assemblies. In each, the main contacts are single break pairs of the butt type, closing by a rolling action from tip to heel. Arc chutes of standard design are employed, their two outer sheets of arc resisting material being separated by spacers which carry the two long arc runners. To each runner is connected a blow out coil, the pair of coils for each assembly being in circuit only during the arcing period to enable the coils to be consequently higher rated. Access to each contact pair is obtained by swinging back its arc shute.

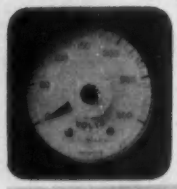


G.E.C.'s air break stator reverser arranged for dynamic braking, with three arc chutes shown in the lowered position

Contactor operation can be effected by either d.c. solenoid or compressed air systems, the contacts, in either case, being driven through insulated push rods from a common-operated shaft mounted in self-aligning ball bearings. To minimise wear and tear on the mechanism, oil-immersed shock absorbers are also fitted. Both mechanical and electrical interlocks prevent more than one unit being closed at one time, whilst a further interlock prevents the closing of no other contactor if arcing persists during the opening of any one.

Moisture and Shock Proof Instruments

NOW available for general industrial, as well as service, use, are new hermetically sealed, 4 in. dial, circular scale flush mounted switchboard instruments, claimed to be the first of their type to be tested and approved by the Ministry of Supply. Manufactured by CROMPTON PARKINSON LTD., Crompton Hse, Aldwych, W.C.2, the new series provides users with compact instruments having long, open scales, and yet capable of withstanding severe operating conditions; they are eminently suitable for use in tropical or polar regions. Included in the range are both m.c. and m.i. types, frequency indicators and wattmeters, whilst p.f. indicators and syncroscopes will, it is hoped, be available shortly.



Crompton have this 4 in. dial hermetically sealed instrument

As a result of the circular scale, a scale length of some 6½ in. can be obtained, despite the limitations imposed by the dial diameter of 4 in. Special features, it is stated, have been incorporated to ensure high accuracy over the operating temperature range of −40° C to 70° C under conditions of 95% humidity, and to enable the instruments to sustain an internal pressure differential of 10 lb/sq in. without leakage, and to resist mechanical shocks up to 50g.

In construction, movement, windings, dial and terminals are mounted on a shock-resisting, nylon filled moulded plastic base to form a complete unit; which is a push fit into a rust proof, heavy gauge, pressed steel outer case. The front end of the base is housed in an aluminium diecast front component, a sealing ring being fitted at each end of the base. The window is of toughened glass, also fitted with a sealing ring to ensure efficient retention of the dry nitrogen with which the completed instrument is filled. Movements are of the shock resisting type, having light moving parts and spring mounted, jewel bearings, whilst the use of rubber grommets to locate the movement in the steel case acts as a further protection.

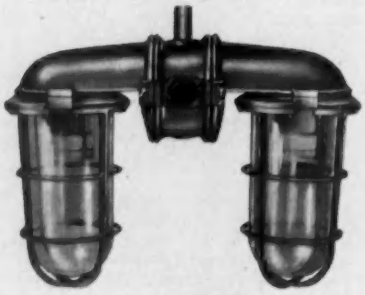
Versatile Lighting Fittings

WHERE stores space is at a premium, as on board ship, lighting units offered by VICTOR PRODUCTS (WALLSEND) LTD., Wallsend-on-Tyne, Northumberland, have a particular appeal. Being produced under licence of Industria Ltd., Rotterdam, the fittings comprise a basic lighting unit of the well glass type, which, together with a number of standard accessories, can be made up into a variety of lighting combinations. Not only does this enable individual requirements to be met, but the stock required is less. Fittings are stated to comply with the requirements of Lloyds, Veritas and Kema.

The 45° angle fitting

For the basic unit and accessories a corrosion resisting aluminium alloy is employed, together with heat resisting rubber gaskets. A guard, mounted on the main housing by two captive screws, is supplied with each unit, whilst reflectors can be fitted if required. By this arrangement, only these two screws need be loosened to remove the entire underpart of the fitting for cleaning and relamping.

Each unit, which is fitted with an internal earthing screw, is provided with an entry spout tapped ¾ in. e.t. as standard. A similar size is employed for junction boxes, which are usually drilled and tapped four ways, each entry being then closed with a rubber plug. Clear well glass is normally employed although frosted and tinted glasses are available. Fittings are offered for 100 W and 200 W tungsten lamps, each available in 45°, 90° angle, pendant and pendant junction box type. Three versions of junction box are also available apart from the basic accessory of connecting chamber which enables dual fittings to be made up.



This dual combination of two 90° angle fittings can be made from the "Victor" range

We regret that the reduction in the size of this issue, consequent upon the rail strike, has made it necessary to hold over our regular weekly feature, "Problems and Practice in Engineering."

Contemporary Lighting by McGeoch

NEW introduction by WM. MCGEOCH AND CO., LTD., Warwick Works, Bordesley, Birmingham 10, is a range of contemporary lighting fittings. There are single and double bracket wall fittings and a three light pendant fitting similar to the two light pendant fitting illustrated, also a single light corner fitting and a single lamp pendant fitting of similar style. The metalwork in each case is in satin brass with red buckram shades. Prices range from £2. 19s. 2d. inc. tax to £10. 6s. 2d. inc. tax. The fitting illustrated costs £7. 12s. 6d. inc. tax.

One of the new McGeoch range in satin brass and red buckram

Graetz Agents in U.K.

A NEW company has been formed with the title GRAETZ (CONCESSIONAIRES) LTD., operating from 193 Mare St, Hackney, E. 8, to import and assemble all the products of the Graetz Company of Germany. At the moment only the radio gramophone chassis are being imported, but it is intended that the firm's hot plates, coffee percolators, and other electrical domestic appliances, including probably a cooker, will subsequently be handled here.

Specialised lighting service

A SERIES of lighting fittings and accessories designed specially for departmental stores, showrooms and other large areas are described in a recent publication by MORLEY'S ELECTRICAL SERVICES (HOLLOWAY) LTD., 117 Hornsey Rd, N.7.

This lists details of the Morlite "Empress" de luxe multi tube diffused lighting unit which takes eight standard fluorescent tubes and is available as either a 4 ft or 5 ft unit. Provision is also made for a 2 ft tube to be fitted transversely at each end to eliminate shadow. The whole of the fitting is fashioned in crystal polystyrene.

A supplementary unit is the "Princess" de Luxe twin tube diffusing unit which is constructed in a similar manner and can be adapted for three tubes. Morlite "Clipfusers" are easy fitting clip on to tube diffusers moulded in crystal polystyrene. These sell at 3s. per 8 in. unit plus 7d. purchase tax whilst Morlite Eggcrate "Multifusers" are made from the same material and can be supplied to any desired measurements to form effective brilliantly lit ceilings without exposing the source of light at normal eye level. Price is 16s. per sq ft.

E.E. Cookers Change in Price

DUE to the continued rise in costs of material and wages, the price of "English Electric" cookers is to be increased with effect from 1 June, 1955, say the ENGLISH ELECTRIC CO., Queen's Hse, Kingsway, W.C.2.

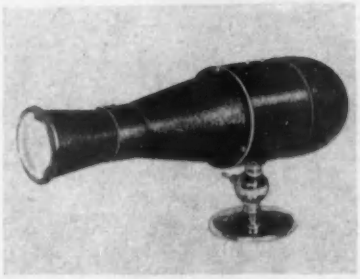
The standard cooker, Model 2009D, will cost £42. 4s. instead of £39. 15s. 6d.

The price of the automatic cooker, Model 2011, will be increased to £61. 10s. from £58.

The optional glass panel for the oven door of both cookers now costs 16s. instead of 15s.

"Atomette" Spotlight Fitting

DEVELOPED for illuminating pictures and various displays where the shape of the object only would be illuminated the "Atomette" projector spotlight introduced by COURTNEY POPE (ELECTRICAL) LTD., Amhurst Park Works, Tottenham, N.15, is a side mounting projector spotlight unit with focusing adjustment using a "Stelmar" optical system and a 24 V 48 W s.b.c. double-pole lamp.



The "Atomette" provides outline spotlighting

A 24 V output mains transformer is utilised in conjunction with the fitting. The spotlight effect is achieved by fitting a cut-out slide in the lens system, this cut-out conforming to the outline of the object to be illuminated. Without the slide the lamp has a throw of 10 ft and illuminates an area of 9 sq ft. This type of lighting installed in the Paris Louvre has created considerable interest.

Silver Exide for Motor Cycles

A NEW 13 Ah Silver Exide battery incorporating three outstanding developments especially for motor cycle use is now available from CHLORIDE BATTERIES LTD., Clifton Junction, Swinton, Manchester.

First is the use of Porvic, the microporous plastic material for separators which makes possible the development of a seven plate battery occupying no more space than the five plate type it supersedes. Second feature is the use of plate grids moulded in the corrosion-resistant CB95 alloy and pasted with improved active materials, and finally the new battery is assembled in a tough leak-proof and shock-proof container.

Capless Flashbulb for Colour Work

THE introduction of a PF.1/97 (Blue) "Photoflux" Capless Flashbulb for colour photography is announced by PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Ave, W.C.2.

The new flashbulb is specially coated to give equivalent daylight at a colour temperature of 6,000° K. It will sell at a list price of 10d. and can be used with all daylight colour materials, either as the sole source of illumination or for supplementing daylight.

For the Electrical Trade

The Rotella Spin Dryer

IMPORTED from Germany and proving a popular line selling at 36 guineas inc. £10. 6s. purchase tax, the Zanker "Rotella" spin dryer handles 7-8 lbs dry weight of laundry and takes out the bulk of water in a few seconds by hydro-extraction. It stands 2 ft 2 in. high is 1 ft 7 in. in diameter and is sturdily built. The drum is rustless and the exterior, porcelain enamel finish. Regional wholesale distributors for Yorkshire and adjacent southern counties are BRADFAX LTD., Castle Blaney Bldgs, Carey St, Bradford. Manufacturers agent is Mr H. J. Tendlow, 16 Lindisfarne Rd, Shipley.

The Rotella dryer is proving a popular sale

Control of Power for Electric Railways

Southern Region's Supervisory System

WE have already published an article in our issue of 25 Feb., 1954, dealing with the general scheme adopted by the Southern Region in the power supply changeover to 50 c/s. Part of this work, which involves the installation of 71 rectifier substations, 70 track paralleling huts and a number of supply points and switching stations, was the introduction of full remote supervisory control from three centres—Raynes Park, Lewisham and Selhurst. All the supervisory equipment is being installed by the General Electric Co., Ltd., and the control centres at Raynes Park and Lewisham are already in operation. In the design of this equipment special attention has been paid to speed of working, an important factor in this connection being the provision for selecting track feeder circuit-breakers in groups and operating them simultaneously when required. Individual operation can, of course, be used. To avoid control operations being delayed by indications, separate control and indication cable cores are used.

Apparatus

Control is effected by means of discrepancy switches and push buttons on a mimic diagram. The small size of the switches, which can be mounted when necessary at 1 in. centres has enabled the complex network of lines supervised from Raynes Park to be shown as a geographical diagram on a straight board 29 ft 5 in. long and 7 ft 7 in. high with the switches in the correct positions on the diagram according to the tracks or feeders controlled by their associated circuit-breakers. The advantage of the small switch dimensions is particularly apparent where multiple tracks have to be shown on the board. On the Raynes Park diagram, for example, there is an eight-track section from Waterloo through Queen's Rd Station, and some 17 miles of continuous four-track main line. The area controlled covers the Western Section main line from Waterloo to Walton-on-Thames with its branches, the Windsor line from Waterloo to Egham with the Windsor-Staines branch, and the Hounslow loop lines. Ultimately 527 circuit-breakers will be controlled from the Raynes Park board, and 627 indications including alarms received.

The system operates on the d.c. total count code system with 50 V on the pilot lines. Should a circuit-breaker trip automatically, an alarm is given which can only be cancelled by the operator turning the discrepancy switch to the "open" position. He can then reclose the breaker by turning the discrepancy switch back to the "close" position and operating the "close" push button. Some delay is naturally introduced by the selecting and operating equipment, the delay from tripping to alarm indication being between 2·5 and 4·5 sec, and the total time, with a skilled operator, from receipt of trip alarm to receipt of reclosed indication being from 8·3 to 13·0 secs.

Rectifier d.c. circuit-breakers are indicated by yellow discrepancy lamps, but do not have individual switches on the panel. When a rectifier a.c. circuit-breaker is closed, the d.c. breaker discrepancy lamp flashes during excitation of the rectifier and is extinguished on the automatic closing of the associated rectifier d.c. circuit-breaker.

Substation faults are indicated by the flashing of the "substation" fault lamp, and when the fault is acknowledged by pushing the "stop alarm" button, the lamp continues to glow steadily as long as the alarm condition exists.

Remote metering facilities are provided on the operators' desk, and lever keys enable substations which have two or more rectifiers to be selected for the purpose of reading the total d.c. current at such a substation at any moment. Other instruments show supply voltage and frequency.

Operational Layout

Two operators are on duty in the Raynes Park control room. Both can work independently as 12 separate control systems are provided, each controlling a maximum of six substations and track paralleling huts or other equipment. As a safeguard against loss of power supply to the tracks, due to the temporary failure of a control system, two control systems follow each route. Substations are connected alternately to one or the other system. The intermediate track paralleling hut is satellite-operated from the substations on each side, and the supervisory control is so arranged that the breakers feeding towards the first substation are controlled from the second substation and vice versa. This ensures that if one supervisory system breaks down, the track can always be kept energised.

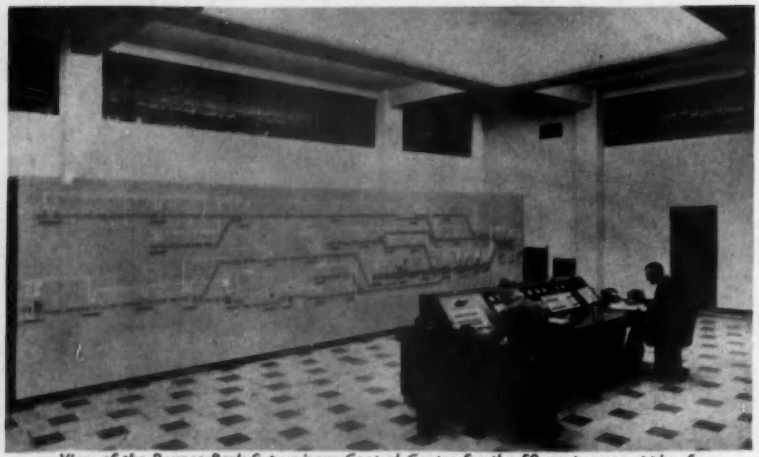
Two pilot pairs are provided for all systems and automatic testing is carried out every 30 minutes for both continuity and insulation, a breakdown being signalled to the control desk. It is estimated that with this system it would be possible for two "perfect" operators to restore the load on the whole system, after every switch had opened, in approximately 5 minutes.

The actual supervisory equipment is divided and housed in two apparatus rooms, substations being connected alternately to each room so that in the event of a fault in either half, adjacent substations are not put out of action and track sections can continue to be fed from one end.

In emergency the Raynes Park control can take over equipment in two frontier substations which are at Queens Rd and Wimbledon, and which would normally be operated from the Selhurst control room. Conversely, Queens Rd and Wimbledon equipments normally controlled from Raynes Park can be taken over by Selhurst control room, and Waterloo substation by Lewisham.

The control facilities at Selhurst will be similar to those at Raynes Park and Lewisham, but Selhurst and Lewisham have provision for controlling and indicating the tap positions of the 45 MVA input transformers at the supply points.

The equipment has been designed to the requirements of the Chief Electrical Engineer of the British Transport Commission and is being installed under his direction.



View of the Raynes Park Supervisory Control Centre for the 50 c s power supply of the South Western Section of the Southern Region

NEWS OF THE WEEK

Co-operation in Nuclear Engineering

INSTITUTIONS FORM JOINT ORGANISATION

CO-OPERATION between existing engineering and scientific institutions to cover advances in nuclear energy is preferable to the formation of a new institution for this purpose, in the view of the Councils of the I.E.E. and the other senior engineering institutions. This was stated last week, when the organisation set up to achieve this purpose was described.

Under the title the "British Nuclear Energy Conference," the organisation is to be managed by a board composed of three nominees from each of the constituent institutions, Civils, Mechanicals and Electricals, Institute of Physics and Institution of Chemical Engineers. Papers on nuclear subjects offered for reading before any of these constituent bodies will be notified to the Conference. Normally, they will be read at a meeting of the institution concerned, but facilities will be offered for members of the other institutions to attend and take part in the discussion.

On occasion, the Conference itself will organise symposia of lectures. The first is planned for the end of Nov., and will deal with the technology of nuclear energy and its applications. Additionally, the board of the Conference proposes to promote from time-to-time, national and international conferences on nuclear topics, and to arrange for British participation in international meetings.

Initially, it is proposed that the expenses of the Conference should be met by the constituent institutions, but once it is fully established, it should be self-supporting. This will come about largely through sales of the Journal which the Conference proposes to publish four times a year. This will contain records of relevant papers and discussions, and of symposia and papers organised by the Board. It will be sold to members of the five institutions at preferential rates.

Chairman of the Conference is Sir Christopher Hinton, of the A.E.A., and Mr A. McDonald (secretary, Institution of Civil Engineers) is acting as secretary. I.E.E. members of the Board are Mr W. K. Brasher, Mr J. Eccles, and Dr Willis Jackson.

Radio and TV Sales Down but Well Above 1954

FIGURES for both the February and March sales of radio and television sets were issued by the R.T.R.A. last week. They showed a steady decline which is always expected at that time of year, but the main interest lies in the comparison with sales in the previous year, and here the latest figures are well above those of 1954. Average number of sets sold per shop were as follows:

	1955	1954
Radio:		
January ...	12·49	8·76
February ...	11·06	8·92
March	10·72	8·56
Television:		
January ...	12·05	7·96
February ...	10·06	6·55
March	7·73	5·42

As regards hire purchase sales, an increase in the proportion of sets sold under these arrangements in February was offset by a reduction in March. In the case of radio 47·9% sets were sold on h.p. terms in March compared with 52·68% in February and 49·61% in January. 58·83% of TV sets were sold in that way in March compared with 60·82% and 58·64% in Feb. and Jan. All these figures exceeded those for 1954.

New A.E.I. Offices

AN island site covering an area of about an acre at 25-35 Grosvenor Place, London, S.W.1—part of which was formerly occupied by E.A.W.—has been acquired by the A.E.I. Group. They are to erect a modern block of offices to accommodate most of their London staff.

Grid Reinforcement by Enfield

SUPPLY and installation of cables between the S. of Scotland Electricity Board's Dalmarnock 132 kV grid substation and Charlotte St substation, Glasgow, is to be carried out by Enfield Cables Ltd. Award of this contract, valued at about £130,000, was announced last week. The installation covers about 3,600 yds, is part of a reinforcement scheme, and is similar to that carried out by Enfield at Braehead.

Electronics Exhibition in Kingston Next Month

PROVISIONAL arrangements have been made for an Electronics Exhibition to be held in Kingston, between 19 and 22 July. The display is being organised by the S.E. Electricity Board's Surrey sub-area with the co-operation of the Kingston and Guildford Productivity Committees. News of this exhibition immediately follows the suggestion in Scotland for an electronics conference and display made by Mr A. Kelso and reported in our 26 May issue. The Electricity Board is to take over the Kingston Technical College during the summer vacation and will provide stands, publicity and other material for exhibitors. About 20 manufacturers of electronic equipment have agreed to take part, and the N.P.L. and Productivity Committees will also have stands.

U.S. Expenditure on Nuclear Development

PRIVATE enterprise in the United States will spend 300 million dollars on nuclear research and development during 1955-58, stated the U.S. Ambassador to the U.K., when opening an exhibition "Atoms for Peace" at London's South Bank site last week. In addition, the U.S. government was spending 600 m dollars for such work on peaceful uses of nuclear energy. The ambassador paid tribute to the close co-operation between the U.K., U.S.A. and Canada in bringing the theoretical possibilities of nuclear power to a working reality.

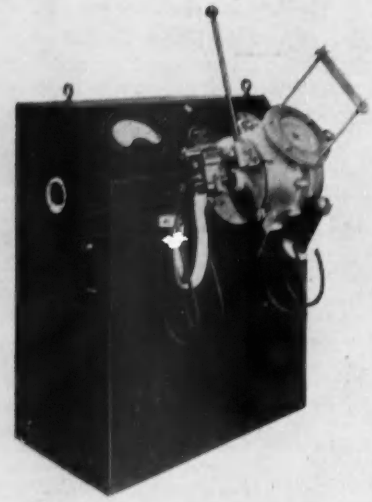
The exhibition is to remain open until Saturday, and afterwards it will go on a five months' tour of the United Kingdom.

European Power Plan

THE Italian Foreign Minister, Sgr. Martino, has called for the association of other countries, especially Britain, in a plan for integration of Europe's nuclear and other power sources. He was speaking to delegates from France, Germany, Italy and the Benelux countries at a conference at Messina. He told representatives of the six Schuman Plan countries he thought it might be possible to find a practical system to allow Britain to take part in the proposed plan, or at least be fully informed about it.

Nalgo Negotiating New Salaries Claim

NALGO are now in process of making another salaries claim in each of the service it caters for, Mr L. H. Taylor, the president, stated at the opening of the Association's annual conference at Brighton on Tuesday. They were not asking for anything like as much as most manual workers, but merely to be restored to the position the employers thought right nine years ago and from which the intervening inflation has shaken the employees, he added. Earlier he referred to the numerous advances made since the formation of the Association, which celebrates its jubilee on 29 July next.



Main interest at Birlec Ltd.-M.E.B. exhibition of electrical melting furnaces at the latter's industrial showroom (6-17 June) is a 35 kW Birlec Tama low frequency induction furnace, being used in the showroom for melting aluminium. Although this size is normally emptied by hoist tilting, the molten metal is being ladled into an E.M.B. diecasting machine for producing mementoes. Left is the company's Model NS Detroit furnace. The exhibition was first announced in our 19 May issue

Mobile Display of Cables to tour U.K.

EMBARKING on an extended tour of England, Scotland and Wales in about two weeks is British Insulated Callenders' Cables Ltd.'s new demonstration caravan. It houses a comprehensive exhibition showing in detail the use of plastic components in the manufacture of cables and flexibles. Also on show are displays showing the composition of plastic materials used for insulating and sheathing wires and cables. Over 600 samples of products include cable and flexibles designed for all kinds of applications. B.I.C.C.'s new mobile exhibition made its debut at Hythe during the company's annual sales conference and is now in London before setting out on its country-wide tour.

Mr H. J. Stone, director and general manager of B.I.C.C. hands over the firm's new mobile exhibition to London regional manager, Mr E. A. Sayers

E.I.B.A. ANNUAL MEETING

THE 1955 annual general meeting of the E.I.B.A. will be held on 5 July, at 11 a.m. Venue will be the Institution of Electrical Engineers, Savoy Place, W.C.2.

Scottish E.C.A. Annual Conference at Pitlochry

ANNUAL conference of the E.C.A. of Scotland took place at Pitlochry just before Whitsun. As is customary the function was confined to members and their ladies and the president and director of the English Association, Messrs A. F. Plummer and L. C. Penwill, and their ladies, were the only guests. Highlight of the conference was Mr D. G. Lindsay's paper on "The Electrical Contractor—what of the Future?" The Association's vice-president examined the future prospects of the industry in Scotland, pointing to certain commercial considerations in the competitive field and to problems confronting the private contractor in his relationship with the nationalised body. Mr Lindsay also spoke on labour problems and on the need for sufficient highly skilled craftsmen and senior technical staff. The paper evoked much interest and lively discussion. The conference included the annual dinner of course, and dancing each evening.

OFFICIAL PUBLICATIONS

CARBON MONOXIDE. Methods for Detection of Toxic Gases in Industry, Leaflet No. 7 (third edition) Published for D.S.I.R. by H.M.S.O. 9d.

C.E.A. RESPONSIBLE FOR PRESERVING RURAL BRITAIN SAY C.P.R.E.

ERECTION of transmission lines appears to be the main concern, so far as electricity is involved, of the Council for the Preservation of Rural England in their annual report for 1954-55 submitted last Thursday. They complain that existing policy lacks adequate consideration for landscape amenity, especially as regards National Parks. They add that if the Electricity Boards are allowed to evade their responsibility in the Parks, they will give even scantier consideration to other proposed schemes. The Council deplores the fact that the National Parks Commission are blamed for delay, and say the blame lies with the Boards for not recognising their responsibility for avoiding disfigurement, where it is just as important to preserve amenities as it is to have electricity.

In the case of Borrowdale, the C.P.R.E. urges a firm stand. The cost of installing underground l.t. cable was infinitesimal compared with the Board's overall expenditure. The annual report states that the Boards seem to be afraid to concede to reasonable demands in that case lest they have a spate of them in the future, but, it is pointed out, if those opposing the scheme give in the Boards will then point to Borrowdale when other schemes are proposed. Opposing the S.W. Board's overhead line in Central Dartmoor, the C.P.R.E. suggest that underground cable be used at national expense and prison labour employed, saying the G.P.O. put their lines below ground. Referring to the Ffestiniog and Rheidel projects the Council commented that the opposition was well worth while, and that the C.E.A. would appreciate they would have a firm opponent on the four Snowdonia schemes, to be opposed outright.

Nothing is added this year to the comments on street lighting columns and equipment made in last year's report. The Council is also to urge that future sites for television transmitting stations should be chosen and the stations constructed so that they could be used jointly by the B.B.C. and I.T.A. so as to avoid duplication.

At the E.C.A. of Scotland's annual conference, left to right, back, Mrs Smellie, D. G. Lindsay, Mrs Lindsay and J. Smellie (secretary, E.C.A. of S.): front, A. F. Plummer, Mrs McCraith, R. D. McCraith (president, E.C.A. of S.), Mrs Plummer, L. C. Penwill and Mrs Penwill

STRIKE BENEFITS E.I.B.A.

THERE may at least be one benefit derived from the rail strike. Friends of E.I.B.A. giving lifts to stranded travellers have hung collecting boxes on their car dashboards for contributions from those they have helped.

S. Wales Board's Latest Stage Lighting Techniques

STAGE lighting is the subject of a series of demonstrations and conference to be held by the S. Wales Electricity Board next week. The latest techniques in stage and coloured decorative lighting will be shown at the Board's Demonstration Theatre in The Hayes, Cardiff, at 7 p.m. on Monday and Wednesday next (13 and 15 June) and at 3 p.m. on Tuesday. The stage has been fitted with up-to-date equipment and excepting a few spot lights the whole installation comprises fluorescent tubes. It can be controlled from black out to full up, the dimming control itself being of the latest electronic design using thermionic valves of the thyratron type. This technique permits control by low voltage miniature switches and dimmers instead of the more conventional switchboard.

In addition to the arrangements already mentioned, demonstrations will also be given at 3 p.m. on the Wednesday for members of the E.A.W. and at the same time on Thursday (16 June) for the Electrical Contractors' Association.

Radio Trade Restrictions to be Enforced in Eire

FIRST prohibition order to be made under the Restrictive Trade Practices Act of 1953 has been announced in Eire for the radio trade by the Minister for Industry and Commerce. Legislation to enforce the Order is to be introduced in the Dail. This action is the direct result of the Fair Trade Commission's report after the inquiry into the supply and distribution of radio sets and accessories. The Ministry's new Restrictive Trade Practices (Radios) Order, 1955, will prohibit a number of restrictive practices found to be operating in the radio trade in Eire.

Kent Bros.' London Office

A NEW branch office was opened in London on Monday by Kent Bros. Electric Wire Co. and E. H. Phillips Ltd. It is at 75 Wigmore St, W.1. The establishment of this office in the West End had become a necessity following the firm's move from Kew to Bracknell (Berks) just over a year ago.

Infra-red Heating for Window Shoppers

SPECIAL consideration has been given to the window shoppers' comfort by Household and Commercial Services Co., Ltd., who opened an electrical appliance shop in South St, Bridport, a few days ago. The firm's director, Mr F. A. Brinson, erected a canopy over the shop and installed infra-red lamps so as to keep the area below it, and in front of his windows, warm. Such consideration is almost bound to attract attention and custom, which may be disturbing to immediate neighbours, who are none other than the S.W. Electricity Board. The heating installation devised by Mr Brinson comprises 23 Philips Electrical infra-red lamps more usually used for chick rearing. The lamps are housed in the canopy, which is about 15 ft long and projects about 3 ft over the pavement. Beneath the lamps and 9 ft from the ground is a metal eggcrate louvre. This is believed to be the first installation of its kind in the country. As for the shop itself, it will display a comprehensive range of domestic electrical appliances including numerous items of particular interest to farmers.

B.M.A. Alarmed at Trolleybus Replacement

PROPOSAL to replace London's trolleybuses by diesel motor buses has now been opposed by the British Medical Association. At the annual representative meeting in London last week fumes from diesel engines were said to be a more likely cause of increased lung cancer than cigarette smoking. A resolution drew attention to the remarkable coincidence between increased use of diesel fuel for transport and increase in lung cancer mortality. It expressed alarm at the forthcoming replacement of 1,800 electric trolleybuses in London by diesel engined vehicles. The resolution was carried unanimously.

The canopy housing Philips' infra-red heating lamps can be seen clearly in this photograph of H. and C. Services' new shop in South St, Bridport.

The First Half-Century

Discussion on the second reading in the Commons of the Government's Bill to extend further the anomalous legislation by which the employer is made liable to pay whether or not he is responsible for an accident occurring, shows how hopeless it is to satisfy the demands of what since 1897 must be regarded as a privileged class. Mr Tennant moved, as an amendment, that no Bill could be considered satisfactory which did not contain provisions for compensation for injury to health, and Sir J. Stirling-Maxwell seconded the amendment, while Mr Burns declared that the present Bill ought to be still further extended. Notwithstanding the Workmen's Compensation Act accidents and injuries in factories and workshops were increasing seriously. The confession is worth note, because it was one of the arguments for the Act that it would decrease them. As a matter of fact, as long as the employer can protect himself by taking care, he has a material besides a moral inducement to do so.—*From our issue of the 8th June, 1905.*

Joint Committee in S.W.

A JOINT Rural Development Committee has been set up in Somerset, Devon and Cornwall, in an effort to seek closer co-operation of organisations interested in electrical rural development. The idea came from the S.W. Electricity Consultative Council. Under the chairmanship of the Consultative Council member, the committees will comprise representatives of the N.F.U. and the Board's sub-area managers, together with members of various other organisations.

Two of the ways in which the committees are expected to prove useful are to limit delays in the preliminary stages of proposed electrification schemes and to explain more fully the advantages farmers may gain by using electricity. Delays are often caused by difficulty in securing the full participation of farmers and other rural dwellers along projected routes. The N.F.U. is to be advised of major rural schemes envisaged and they will endeavour to persuade farmers by pointing out the likely benefits.

NEWS IN BRIEF

Muirhead and Co., Ltd., makers of electrical precision instruments are establishing a branch factory at Stratford, Ontario.

An order has been placed with the G.E.C. by Messrs J. Charters for the diesel-electric propulsion and auxiliary power equipment of the 800-ton research ship to be built by Fleming and Ferguson Ltd. for Falkland Islands Dependencies Survey.

Machining facilities to be installed in Toronto by Permali (Canada) Ltd., subsidiary of the Gloucester Co., Permali Ltd.

Holiday and work were combined by Mr Charles H. Campbell, director of British Information Services in Washington D.C., when he returned to Lancashire recently. He spent a day at the English Electric East Lancashire Rd works examining the company's range of domestic appliances.

COMPANY ACTIVITIES

SO far as I am aware, Sir John Dalton, chairman of W. T. Henley's Telegraph Works Co. is the first to announce that the cable industry has practically overcome the difficulties of 1954, which included increasing raw material prices, especially rubber and copper. It is customary and necessary that the price of rubber cables be held firm for as long as possible in the interests of customers. There is always a delay, therefore, in amending cable prices to compensate for raw material prices. Henley's were forced to put up prices in Sept. last, together with other cable makers, while further raw material rises until the end of the year have compelled a further increase this year. Financially the 1954 outcome was a 25% drop in profits to £905,649. According to Sir John, the present position is that the export division, despite the higher prices, is now dealing with an all-time record of enquiries for export business, while the order book to date for the home market is also a record for the company.

Wisely, the group has used the difficult period to strengthen its resources. A sound liquid position is evident by an excess of current assets over current liabilities of £7 millions.

Speaking at the annual meeting on Friday, Sir John thought it reassuring the way the industry adapted itself, by and large, to the requirements of a modified trading structure last year. The general economic outlook, at least in this country, is also reassuring. Current industrial activity, with full employment at home, he believes is likely to be further stimulated by the schemes of railway modernisation announced by the British Transport Commission and the further increases in capital investment expected this year as compared with last year, in Coal Mining, Gas, Railway and Air Transport and the Post Office services.

I give full marks to William Charles Pegley, chairman and managing director of Vactric Ltd., for another substantial improvement in trading results. Profits jumped from £364,218 to £548,188 and there is to be a dividend of 15% on £300,000 capital as against 10% on £150,000 prior to the one-for-one Ordinary scrip issue, when holders also received one 6% £1 Preference for every four 5s. Ordinary. I cannot help thinking that all these profits cannot have come from the manufacture and sale of electrical domestic appliances, especially in view of the curbs on hire purchase. It is currently suggested that the company is doing well from sub-contracting for the aircraft industry. The full report is awaited with considerable interest. There was considerable profit-taking on the results and at around 16s. the 5s. shares yield a well-covered 4½%.—*From our City Correspondent.*

Barton and Sons Ltd.

Trading conditions for the first few months of 1954 did not show much improvement on 1953, but during the last six months of the year sales increased,

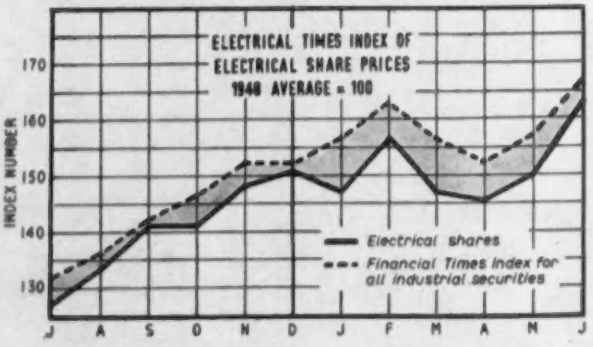
Year to 31 Dec.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	494,314	161,278	66	12½	8/-	5/3
1951	772,813	292,742	133	15	11/5	7/4
1952	695,888	223,350	77	15*	9/11	7/10
1953	614,856	214,947	56	15	11/7	9/5
1954	743,298	290,487	66	17½	13/3	9/7

*Capital bonus of 25%.

and this brought into production new plant which had been installed in 1952. Mr A. Redfern, the chairman, reports. Trading results of the overseas subsidiaries were very satisfactory, and since the end of 1954 the whole of the issued share capital of two additional Companies has been acquired—Eyland and Sons Ltd., who make buckles, and Springs and Pressings (Darlaston) Ltd., who manufacture springs and spring washers. In addition to the final dividend it is proposed to make a bonus issue of one fully paid 5s. Ordinary share for every 30s. of Ordinary stock held.

Sydney S. Bird and Sons

There is to be a one-for-one scrip issue, and the directors also propose consolidation from 2s. to 4s., and a rights issue to holders of one 4s. share at a price of 4s. 6d. for every two held.



Both share price indices jumped over 10 points during May. Greater increase was shown by the "Electrical Times" index for electrical shares which rose by 12·6 to 162·6. "The Financial Times" index for all industrial share prices rose from 157·1 to 166·9

Brazilian Traction Light and Power Co.

The net profit for 1954 amounts to $19,849,015, compared with $20,986,914 for the previous year. The directors have introduced a new by-law sanctioning the payment of dividends in shares, the old by-law having become ineffective.

British Thermostat Co. Ltd.

A final dividend of 12½% plus bonus 7½% for the year ended 31 Jan. last, again makes the total 27½%, but on increased capital. The group profit for the period is £293,793 (*£198,499*).

Crofts Engineers (Holdings)

It is proposed that 1,600,000 Ordinary 5s. shares be issued by way of capitalisation of reserves, in the proportion of one new share for every two held, and that 1,200,000 Ordinary shares be offered to shareholders at 10s. each in the proportion of three for eight.

Elliott Brothers (London) Ltd.

The proposed new issue of capital will raise about £650,000, Mr R. E. F. de Trafford, the chairman, stated last Thursday. The intention is to provide about half the amount by a rights issue of Ordinary shares, and the remainder by a Preference issue.

Garrard Engineering and Manfg. Co. Ltd.

Profit for the year to 31 Jan. last is £142,357 (*£105,854*) after charging taxation. The final dividend is 6% on increased capital.

W. T. Henley's Telegraph Works Co.

Expenditure incurred on new plant for the factories and on other capital additions last year amount to about £433,000, Sir John Dalton, the chairman, stated at the annual general meeting last Friday. The directors are considering the question of providing additional factory space to cater for the rapidly expanding engineering side of the company's business.

Morgan Crucible Co. Ltd.

The group profit for the year to 31 Mar. last is £2,060,483 (*£1,565,635*) and the Ordinary distribution is raised by 3½% to 17½%, the final dividend being 9% plus 2½% bonus.

Power Securities Corpn. Ltd.

During the year a total of approximately 800 miles of h.t. transmission lines were erected, and the company still has in hand the erection of some 2,000 miles of transmission lines for the C.E.A. and the North of Scotland Hydro-Electric Board. Progress continues satisfactorily on the construction of the Staythorpe and Carmarthen Bay power stations, Sir Andrew M. MacTaggart, the chairman, adds. In addition, the company has carried through a considerable number of other contracts, while overseas a large volume of work is being handled.

Towards the end of the year the company accepted an invitation by the War Office to take over the operation and maintenance of the electrical installations

Year to 31 Dec.	£ Trading Profit	£ Net Profit*	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	440,166	135,975	26	6	26/9	22/-
1951	535,336	134,835	26	6	28/9	25/3
1952	441,208	130,842	24	7	25/6	19/6
1953	624,208	137,639	25	8	29/-	22/6
1954	928,287	262,514	45	9	42/6	27/9

*Attributable to parent company.

in Suez Canal British Military Zone, and the take over is now in progress, a small subsidiary company having been formed for the purpose.

Reason Manufacturing Co. Ltd.

The dividend for the year ended 31 Jan. last is again 20%. Revenue for the period is £5,164 (*£5,158*), less debenture interest £1,000 (*same*), and taxation £937 (*£868*).

Scottish Cables Ltd.

For the year to 31 Mar. last the trading profit is £338,514, compared with £341,539 for the previous eleven months. The final dividend is 20%, again making the total 27½%.

Vactric Ltd.

The group profit for the year ended 26 Mar. last is £548,188 (*£364,218*). The dividend is 15% (10%) on larger capital.

Vent-Axia Ltd.

A final dividend of 55% makes the total distribution for the year ended 31 Mar. last 85% (*70%*). The group profit is £158,346 (*£115,317*).

Allen West and Co. Ltd.

The past year has been a very satisfactory one, it may be judged from the results given in our accompanying table. Mr M. W. H. Lancaster, the chairman, reports that the order book remains healthy. During the year £100,000 worth of new plant was delivered to the company, while the balance sheet shows an increase of £41,000 in the item for freehold land and buildings. This is the result of acquiring a building for £16,000, practically adjoining the present Lewes

Year to 31 Jan.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	706,835	254,664	50	12½	14/5	10/6
1952	951,980	296,870	58	15	12/-	8/3
1953	1,068,366	428,818	67	15	14/4	10/3
1954	995,484	338,600	53	17½*	19/10	12/7
1955	1,006,883	425,446	42	15	15/7	8/-

*Plus capital bonus of 50%.

Rd property, enabling the leasehold store in Hove to be vacated. The balance of £25,000 is the initial expenditure on No. 4 factory at Moulsecoomb which is now being built. In the current assets the value of stock and work in progress is listed at £1,266,878 (*£1,264,056*), while cash at bank and in hand amounts to £1,173,318 (*£1,171,767*).

Dividends Declared

Crofts Engineers (*Holdings*). Interim 7½% (*same*).

S. Smith and Sons (*England*) *Ltd.* Interim 5% (*same*).

ELECTRIC SUPPLY NEWS

Eire

Indicative of the developments now under way by the Bord na Mona and the Electricity Supply Board, no coal has been imported into Dublin in the last eight months for the generation of electricity. This was revealed a few days ago by Mr S. McKenzie, president of the Dublin Chamber of Commerce, at its general meeting, when Dr C. S. Andrews, managing director of the Bord na Mona, gave an address on "Peat in Ireland." In this he stated that the most important feature of this programme was the fundamental change which had been made in the Board's activities by the decision to produce milled peat rather than sod peat for the generation of electricity. At least 500,000 tons of sod turf would be used annually in the generating stations at Portarlington and Allenwood, and in a new station which was being erected at Lanesboro, Co. Longford. About 2,500,000 tons of milled peat would be available annually for electricity generation at Doire Dhraigheach, Westmeath; Bangor-Erris, Co. Mayo; Oweninny, Co. Mayo; Ferbane, Co. Offaly; and Blackwater, Co. Offaly. The effect of this contribution would be that about 40% of the Electricity Supply Board's installed capacity would be based on turf fired stations.

Ilfracombe

The U.D.C.'s general purposes committee has decided not to appeal against the Devon C.C.'s decision in granting permission to the South Western Electricity Board to place overhead lines over Slade Valley Rd to Pretoria Terr. One member, Mr J. L. Jemmett, said he did not think the Council had a chance in an appeal, as it had permitted overhead wires to be used on its housing estate in the same valley. He moved no action to be taken.

Midlands Board

Nearly £900,000 is to be spent on the development and reinforcement of electricity supplies in the Midlands Electricity Board's Shropshire and Herefordshire sub-area during the current financial year. That sum will include £421,000 on rural development and new housing. Giving details of the programme, Mr W. Winwood, sub-area manager, has told the local Consultative Committee of the £421,000 for rural development and new housing, about £50,000 is to be devoted to the connection of over 1,600 new houses in urban areas. The pace of the rural electrification work will be increased by putting out to contract the overhead line construction work and some of the preliminary work such as surveying, wayleaving and the completion of agreements with prospective consumers. Mr Winwood tells us that it is proposed to hand the contractor a plan on which the approximate routes of h.v. and l.v. are shown. The contractor will then obtain the necessary statutory consents and obtain wayleaves, etc. It is not intended that the contractor will carry out any of the commercial negotiations; these will be done by the Board as usual. The current year's programme provides for the connection of 2,788 rural premises, including 553 farms. The development schemes number 32 in the Shrewsbury district, 29 in Wellington district, 35 in Ludlow district, 45 in Hereford district, and 25 in Leominster district. The system improvement and reinforcement programme being carried out by Mr G. W. J. Newey, sub-area engineer, and his staff, includes the erection of a new 33 kV line from Ironbridge power station to Weir Hill, Shrewsbury, with a new h.v. transformer station, estimated to cost £59,000. In the Wellington district a £92,000 scheme includes an increase in the capacity of a major substation, and the erection of six miles of 33 kV line. A further 8½ mile of 33 kV o.h. line are to be erected in the Ludlow district, ten miles, with a new substation in the Leominster district, while in the Hereford district it is hoped in the course of the next two or three years to erect a new 132 kV substation in the vicinity of Hereford.

N. of Scotland

The work of laying a 11 kV submarine cable across the Sound of Gigha, between Kintyre and the Island of Gigha, was completed by the North of Scotland Hydro-Electric Board last week-end. The cable will carry power from the Board's Glen Lussa scheme. The cost of providing the supply to Gigha's 73 consumers is estimated at about £20,000.

Sayings OF THE WEEK

"Increasingly we are likely to be faced with devices for reducing and diminishing the jobs our muscles are designed to do." . . . MRS K. SAVAGE, writing in the *Family Doctor* on the possible effects of labour-saving devices on people's muscles.

"The success of the Electrical Contractors' Association is due to the fact that it holds the balance between the big contractor and the small contractor so fairly, and failing to do that is the weakness of so many trade associations." . . . MR. A. F. PLUMMER, in his Presidential address to the E.C.A. Conference.

"Fuel is wasted because there are not enough men in British industry with the knowledge of how to use it properly. The lack of knowledge is evident at almost all levels." . . . in the first annual progress survey of the National Industrial Fuel Efficiency Service.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

10 June—Inverness. Lamps for Craig Dunain Hospital Board, in year from 1 July.—See 26 May issue.

11 June—Glasgow. Cables, lamps and electrodes for Clyde Navigation Trust.—See 2 June issue.

11 June—Willenhall U.D.C. Class A mercury discharge lighting in Moseley Rd, and at Fibbersley.—See 2 June issue.

13 June—Dewsbury T.C. Rewiring at two schools.—See 26 May issue.

13 June—N. Ireland. Installation in county intermediate school at Cloundagh, Portadown.—See 5 May issue.

13 June — Oldbury T.C. Concrete columns, time switches, and H.P.M.V. lamps, etc.—See 26 May issue.

13 June—Tonbridge R.D.C. Electric wiring in houses and flats at Paddock Wood, Capel and Hadlow. Engineer and Surveyor, 48 Pembury Rd.

13 June—West Riding. Maintenance of refrigerators.—Advertised in 12 May issue.

15 June—Swansea T.C. Installation at Mynyddbach county secondary school.—Advertised in 26 May issue.

16 June—Newbury T.C. Installation in 34 houses in Cromwell Rd, and 32 in St. Michael's Rd.—See 2 June issue.

16 June—Watford T.C. Improved lighting at the town hall.—Advertised in 19 May issue.

17 June—Belfast T.C. Condenser tubes, tube plate ferrules and packing.—Advertised in 26 May issue.

17 June—Carlisle T.C. Installation in Margaret Sewell school.—See 2 June issue.

17 June—N. Ireland. Electrical installation in Inland Revenue offices in Carrickblacker Rd, Portadown. Ministry of Finance (Room 103), Law Courts Building, May St, Belfast.

17 June—Morley T.C. Sodium lighting along A.643.—Advertised in 26 May issue.

18 June—Stewartry and Kirkcudbright T.C. Electrical installation in junior secondary school at Dalbeattie. Apply by above date to County Architect, County Offices, Kirkcudbright.

20 June—New Windsor T.C. Sodium vapour street lighting in class A along Clarence, Dedworth and Winkfield Rds, and in class B along adjacent side streets.—See 2 June issue.

20 June—West Riding. Rewiring electrical installation at Batley girls' grammar school. J. E. Littlewood, Div. Education Officer, Education Offices, Batley.

22 June—Cornwall. Low- and high-lift pumps, electric motors and equipment for Fowey River Water Committee.—See 26 May issue.

23 June—Manchester T.C. Installation in Home for Aged in Sale Rd.—Advertised in 19 May issue.

27 June—West Riding. Renewal of electrical installations at Todmorden C.E. School and Maltby Craggs junior mixed and infants' school. Apply by 11 June to County Architect, Bishopgarth, Westfield Rd, Wakefield. Deposit £1. 1s. in respect of second item.

27 June—West Riding. Renewal of electrical installation at Hebden Royd C.E. school. Apply by 13 June to Divisional Architect, Bishopgarth, Westfield Rd, Wakefield.

28 June—Goole T.C. 300 kVA diesel alternator and duplicate busbar switchgear.—See 19 May issue.

29 June—Lisburn (Antrim). Installation in intermediate school at Forthill.—See 2 June issue.

30 June—Farington (Lancs) P.C. Street lighting installation in parish.—See 26 May issue.

1 July—Kirkcaldy T.C. Electrical installation, including floor warming at Old Folks' Home in Dunnikier Rd. Burgh Engineer, Town Hall.

1 July—Macclesfield T.C. Supply and erection of 80 sodium lighting units on concrete columns along Hurdsfield Rd, Cumberland and King Edward Sts. J. H. Dossett, Borough Engineer, Town Hall. Deposit £2. 2s.—Advertised in this issue.

5 July—Bedlington (Northumb) U.D.C. Vertical spindle unchokeable centrifugal pumps, driven by electric motors.—See 2 June issue.

6 July—Bingley U.D.C. Supply and erection of 20 concrete columns, lanterns, auxiliary gear, etc., for street lighting in Cottingley Moor Rd. Surveyor, Town Hall. Deposit £2. 2s.

9 July—Co. Louth. Pumping and water filtration plant in supply system for villages of Louth, Mullacrew and Tallanstown.—See 12 May issue.

No date stated—N. of Scotland H.E. Board. Submarine cables between number of islands in Outer Hebrides.—Advertised in 26 May issue.

No date stated. N. of Scotland H.E. Board.—Supply and installation of l.v. cables, lighting and heating services for Cluanie Dam and Loyne Tunnel power stations, Kennedy and Donkin, engineers, 12 Caxton St, London, S.W.1. Deposit £2. 2s.—Advertised in this issue.

No date stated—Troon T.C. Electrical installation in four shops and 18 houses in Muirhead housing scheme. A. R. Macleod, town clerk, Municipal Buildings.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

24 June—India. Outdoor and indoor switchgear and other equipments for eleven 33/11 kV substations, in Mettur interconnection scheme. Specif. E.261. Superintending Engineer, Technical (Electrical), 157 Mount St, Madras. B.o.T. (Ref.: ESB 11194/55).*

24 June—South Africa. Fourteen motor generator sets comprising d.c. generator continuously rated output of not less than 2 kW at 110 V and 2·5 kW at 140 V compound wound with commutating poles driven by squirrel cage induction motor to operate on 380/400 V 3-phase 50 cycle a.c. supply. Stores Dept., S. African Railways. B.o.T. (Ref.: ESB 11443/55).*

24 June—South Africa. Tenders (C.5004) invited for 14,900 ft lead alloy sheathed paper insulated star quad local cable; 4,700 ft underground armoured lead alloy sheathed paper insulated twin cable; and 11,900 ft V.I.R. underground armoured star quad twin cable, for Stores Dept., S. African Railways. B.o.T. (Ref.: ESB 11444/55).*

1 July—South Africa. Supply of 300 electric motor driven blower type steam unit heaters for Stores Dept of S. African Railways at Johannesburg. Tender No. F.5046.

5 July—New Zealand. Director-General, Stores Div, G.P.O. require combined vacuum cleaner-floor polisher, operating from 230 V 50 c.p.s. and incorp. scrubbing, suction squeegeeing, floor polishing and vacuum cleaning. B.o.T. (Ref.: ESB 10600/55).*

7 July — Australia. Three turbine auxiliaries starting boards for operation in 440 V 3-phase 50 c/s system at Bunbury power station. Spec. No. 22/BUN. State Electricity Commission of Western Australia, Perth. B.o.T. (Ref.: ESB 10867/55).*

12 July—India. Tenders (No. GE-2/1955) invited for supply of 500 15 kVA 11/0·4 transformers. Documents at Rs. 10 per copy from N. Chakravarti, chief engineer,

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 121 queries answered this week

"Golden Hind" refrigerators, makers of? E.C.—D. Drake and Son Ltd., Orchard Lane, Pokesdown, Bournemouth.

"Speedfix" insulating tape, makers of? C.A.—Industrial Tapes Ltd., 142 Old St, E.C.1.

"Diamond" aluminium ware, makers of? S.E.B.—London Aluminium Co., Ltd., Westwood Rd, Witton, Birmingham 6.

"Fortune" pressure cookers, makers of? E.M.B.—F. and F. Electrical Fittings Ltd., 33 Alfred Place, W.C.1.

"Hopkins" brewery equipment, makers of? T.B.—G. Hopkins and Sons Ltd., United Hse, North Rd, N.7.

Kettle de-scaling fluid, producers of? S.B.—Kleenoff Co., 7 Crompton Way, Manor Royal, Crawley, Sussex; and there is also the "Fur-offit" fluid supplied by Drake and Gorham Wholesale Ltd., 77 Long Acre, W.C.2.

Flexible to rigid conduit adaptors with an earth terminal, makers of? S.B.—Fitter and Poulton Ltd., Vincent Parade, Balsall Heath, Birmingham 12.

Electricity Dept., Uttar Pradesh, Lucknow.

27 July—Australia. Supply of six electric locomotives for Open Cuts at Yallourn and Morwell, Victoria, in accordance with specif. No. 55-56/3 and A.7 contract conditions, for State Electricity Commission. Particulars from Agent-General for Victoria, Victoria Hse, Melbourne Place, Strand, London, W.C.2.

1 Aug.—India. Construction of 110/66 kV double circuit transmission line from Travancore Cochin State border to Udumalpet, about 20 miles; and a 66 kV single circuit line from Villupuram to Pondichery, about 24 miles. Specif.: E.259. Superintending Engineer, Technical (Electrical), Govt. Electricity Dept., 157 Mount Rd, Madras. B.o.T. (Ref.: ESB 11193/55).*

2 Aug.—Kuwait. Separate tenders invited for (*a*) electrical installation materials, including bakelite lampholders, ceiling roses, switches, wiring clips, insulation tape, etc.; and (*b*) electrical reflectors and floodlights. Govt's Dept. of Electricity. B.o.T. (Ref.: ESB 10316/55, and 10517/55).*

4 Aug.—Egypt. Supply and erection of transmission lines feeding city of Damrietta and Ras-el-Barr. Office of Director General, Mechanical and Electrical Dept., Ministry of Public Works, Cairo. B.o.T. (Ref.: ESB 11412/55).*

12 Aug.—Australia. Mackay Harbour Board, Mackay, Queensland, require electrically operated travelling gantry loader, for loading sugar into ships at rate of 650 tons an hour. Documents available from consulting engineers, A. S. MacDonald, Wagner, and Priddle, 9 Young St, Sydney, or 235 Brunswick St, Valley, Brisbane, at £10 per set.

16 Aug.—Egypt. Fire pumping units required for electrically driven pumping station at Dar-el-Salam. Also Daraw Irrigation Pumping Station extension. Director-General, Mechanical and Electrical Dept., Ministry of Public Works, Cairo. B.o.T. (Ref.: ESB 11316/55).*

16 Aug.—New Zealand. Supply of 22 kV switchgear for Otahuhu substation for State Hydro-Electric Dept, Wellington. Tenders to secretary of Tenders Committee. Contract No. 274.

10 Oct.—Australia. Supply, erection, etc., of nine electrically driven level luffing, portal, jib cranes for Port Kembla Harbour, to contract No. 93–54/55 H. and R. Documents from Agent-General for N.S.W., 56–57 Strand, London, W.C.2, quoting ref.: F8028 ESC.

No date stated—Iraq. Supply and installation of two diesel engines with pumps and a.c. generators for Rest Hse at Zawita. Govt. of Iraq's Development Board, Baghdad. B.o.T. (Ref.: ESB 9960/55).*

No date stated—Uganda. Installation of electric lighting and power in Govt. buildings at Masaka (contract 279) and at Soroti (contract 280). Apply in both cases to Director of Public Works, P.O. Box 10, Entebbe. B.o.T. (Ref.: ESB 10789/55).*

Contracts Placed

Hebburn-on-Tyne U.D.C. Installation in ten shops and flats on Monkton Lane estate, Tanjon Ltd.

Metropolitan Water Board. Cables, conduit, terminal boxes, wiring, etc., at Ashford Common waterworks. George E. Taylor and Co. (London) Ltd., £2,432; 750 kVA transformer and pumping at Bexley, Foster Transformers Ltd., £1,545.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 7 June

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	352	+18	237½
„ (3 months)	334	+12	236
R.S.T. (Rhodesian Selection Trust) group price*	—	—	—
LEAD, refined pig, min. 99·97% purity (cash)	103	+12½	98½
„ (3 months)	103	+13½	95½
TIN, refined, min. 99·75% purity (settlement)	718½	−1½	724
„ (3 months)	719½	−½	724
ALUMINIUM, ingots 99·99·5%	163	—	156
ZINC, virgin, min. 98% purity (cash)	90½	−13½	81½
„ (3 months)	89½	−13½	81½
RUBBER No. 1, RSS, spot (per lb.)	31d.	+3½d.	19½d.
„ c.i.f. basis, ports, Aug. (per lb.)	28½d.	+1½d.	19⅞d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52½	—	51
Mild Steel Tape (0·014 in.)	41½	—	40

(*Fixed price c.i.f., U.K. for 30 days from 9 May to "consumers willing to instil a degree of stability into the resale price".)

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Barwon Electrical Consultants Ltd., 13/14 St. Andrews Hse, Holborn Circus, E.C.1. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £100. Dirs.: to be appointed by subscribers. Subs.: A. Goodman, St. Andrews Hse, Holborn Circus, E.C.1 and L. A. Moss, 22 Wychwood Ave, Canons Park, Edgware, Middx.

Jenkins Electrical Ltd., 83/5 St. Mary Rd, Walthamstow, E.17. Electrical, radio and electronic engineers and contractors, etc. Nom. cap.: £3,000. Dirs.: H. G. Jenkins, S. A. Jenkins and S. A. G. Clark.

Wholesale Electric (Liverpool) Ltd. 63 Scotland Rd, Liverpool 3. To acquire all or any of assets of Benjamin and Evelyn Cadwallader trading in partnership as "Wholesale Electrical Equipment Company" at Liverpool, and Southport, and to carry on business of wholesale distributors of and agents for cable, switchgear and electrical equipment of all kinds, etc. Nom. cap.: £4,000. Dirs.: B. Cadwallader and Evelyn Cadwallader.

David Hannah and Co., Ltd., 2a Buchanan Rd, Liverpool 2. Refrigeration and cold storage engineers, etc. Nom. cap.: £1,000. Permt dirs.: D. Hannah and Mrs M. Hannah.

Gregelec Ltd., 1 Pavilion Buildings, Brighton. Electrical contractors, engineers, etc. Nom. cap.: £1,000. Dirs.: S. A. Gregory, F. G. Brownings and K. J. Steel.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Tremix. 733,4947/943S. Vibrating machines for concrete. Trupal Eng. Ltd., 117 Stalker Lees Rd, Sheffield 11.

Toolit. B.737,073. Class 7. Hand tool incorporating an electric torch. Robert Mitchell, 355 Chester Rd, Castle Bromwich, Birmingham.

Superthane. 729,338. Class 9. Insulated wire covered with synthetic enamel. W. T. Henley's Telegraph Works Co., Ltd., 51/53 Hatton Gdn, E.C.1.

President. 737,372. Class 9. Automatic regulating apparatus for controlling temperature, humidity, liquid level, etc. J. R. Seville, Oaklea, Stansfield Rd, Waterfoot, Rossendale, Lancs.

Gazette Announcements

COMPANIES ACTS

Steamlyne Electrics Ltd. Meetings of members and creditors will be held at Walter Hse, 418-22 Strand, W.C.2, on 1 July at 11 and 11.30 a.m. resp.

F. Clough and Co. (Electric Washing Machines) Ltd. Resolution for voluntary winding-up passed at meeting on 17 May. Creditors subsequently appointed J. Colman, 1 Dalton Sq, Lancaster, as liquidator.

Keymer Moulded Products Ltd. Resolution for voluntary winding-up passed at meeting on 16 May when W. R. G. Weaver, A.C.A., 29 Ludgate Hill, London, E.C.4, was appointed liquidator.

Electrical Accessories (Lancaster) Ltd. Creditors are asked to send particulars to liquidator, R. P. Booth, C.A., of Parkin S. Booth and Co., 5 Rumford Place, Liverpool, by 24 June.

Midland Counties Electrical Engineering Co., Ltd. Final general meeting will be held at 4 Waterloo St, Birmingham, on 5 July to receive liquidator's report.

Auto-Cold Refrigeration Ltd. C. H. Barclay, liquidator, of 5 Giltspur St, London, E.C.1, released as from 24 Mar.

Transformer Steels Ltd. Resolution for voluntary winding-up passed at meeting on 19 May. G. L. Lawford, of 2 Wentworth Way, Pinner, Middx, was appointed liquidator.

South Essex Electrical Installations Ltd. Resolution for voluntary winding-up passed at meeting on 24 May, when V. L. Bell, 141 Moorgate, London, E.C.2, was appointed liquidator.

BANKRUPTCY ACTS

Intended Dividends

Salisbury. William H. T. Mason, trading as W. H. Mason and Son, electrical engineer, at Castle St, Mere. Last day for receiving proofs 11 June. Trustee is H. P. Tripp, cert. acc., 34 Fisherton St, Salisbury.

Tunbridge Wells. Jack C. R. Gillitt, trading as C. Gillitt and Son, electrical contractor, at 19 Stangrove Rd, Edenbridge. Last day for receiving proofs, 10 June. Trustee is R. B. M. Knight, 52 Old Steine, Brighton.

Application for Discharge

Croydon. Douglas Cromwell and Valerie I. Cromwell trading together as Cromwell and Co., makers of electrical fittings and lampshades, at 76 High St, Croydon. Hearing fixed for 30 June, at 11 a.m., at County Court, Scarbrook Rd, Croydon.

BUSINESS PROSPECTS

Home

Blaby (Leic) R.D.C. Total of 40 houses to be built at Blaby, Braunstone and Glenfield.

Blackpool T.C. It is proposed to build 42 flats on Mereside estate.

Bolton T.C. Plans in hand to erect 63 dwellings and 6 shops off Wasdale Ave, 22 bungalows each in both Moss Bank Way, and Yewdale Gardens.

Brechin T.C. Hundred houses to be built in Montrose St development scheme.

Brighton T.C. Erection of 20 dwellings in Birdham Rd, and 24 on Hollingdean estate. Borough Engineer and Surveyor, 26-30 King's Rd. Separate contracts.

Chingford T.C. Erection of office block proposed at The Ridgeway. Architects are Tooley and Foster, Midland Bank Chambers, Buckhurst Hill.

Cobham (Sur). Instalment of C. of E. secondary mixed school to be included in 1955-56 building programme. Cost estimated at £116,854.

Dartford. Permission sought for phase 2 of modernisation of Darenth Pk Hospital. Cost estimated at £58,000.

Edinburgh. Dean of Guild Court has approved erection of 64 houses at Oxgangs Bank, and 26 old peoples' houses in Loaning Rd.

Felling (Dur). Grimshaw Leather and Co. propose motor car showroom in Sunderland Rd. Architects are Manchlen and Weightman, Saville Row, Newcastle.

Gosforth. Site for offices and store near North Rd being sought by John Blackwood Hodge and Co., Ltd., Euclid Works, Northampton.

Hampshire. Sketch plans prepared for Whitehill Bordon mixed secondary modern school.

Harlow. Tenders being invited for erection of 400 dwellings, block of shops, community hall, etc., by Development Corporation.

Linlithgow. Caledonian Associated Cinemas Ltd., of 5 Drummond St, Inverness, are seeking permission to erect cinema in High St.

Liverpool T.C. Extensions to Speke No. 3 and Whitefield Rd county primary schools. City Architect, Blackburn Chambers, Dale St, Kingsway.

London. Showroom and offices to be built in Old Bond St by Delbourne Properties Ltd. Architects are C. Edmund Wilford and Son, 2 Green St, W.1.

Long Eaton (Notts). Architect for Wallis and Co. (Long Eaton) Ltd.'s new factory in Nottingham Rd, is J. W. Wilcox, 2 Waverley St.

Newport (Mon). Approval sought for girls' secondary modern technical school at Duffryn and Ringland primary schools. Estimated costs £219,542 and £94,076 resp.

Purley. Approval granted for provision of new eye dept. at Royal Berkshire Hospital. Estimated cost, £50,000.

Sheffield. British Steel Castings Research Assoc. are erecting research station.

Shepshed (Leic) U.D.C. It is proposed to erect 18 houses and 4 bungalows in district.

Stratford-on-Avon T.C. Construction of 32 flats and 20 houses on Redlands estate. P. C. Smart, Borough Engineer and Surveyor, Municipal Offices, Rother St.

Whitley Bay. Construction of R.C. primary and technical school near Foxhunters' Inn being planned by Northumberland education committee.

Overseas

Eritrea. Representation of U.K. manufacturers of electric lamps sought by Mr B. E. Delbourgo, Via Martini 5, Asmara.

Kuwait. Fahad Sultan and Co., Ltd., P.O. Box 208, Kuwait, wish to contact U.K. manufacturers of air coolers and refrigerators with view to concluding agency agreements.

Malaya. H. Bersu and Co., Ltd., 94a Robinson Rd, Singapore (P.O. Box 1434), would like to represent U.K. manufacturers of electric cables, and suppliers of electrical fittings and novelties.

New Zealand. U.K. agencies for domestic electrical equipment sought by Mr F. P. Wills, director, Autocrat Distributors and Autocrat Radio Ltd., 285 Great South Rd, Auckland S.E.4.

Trade Notes

Change of Address. The Engineering and Export Co., Ltd., has now moved to "E.E." Works, 47 Penn St, Birmingham 4. Telephone Aston Cross 5121.

Distributors. A. B. Hobbs and Co., 214 Hatfield Rd, St. Albans, have been appointed sole distributors in the U.K. for the "Zedes" electric soldering irons made by Hydrel Ltd. of Switzerland.

Agents. Aerex Ltd., of Sheffield, and F. H. Biddle Ltd., 52 Clerkenwell Close, London, E.C.1, have entered into an agreement whereby the latter firm becomes the sole selling agent for "Aerex" duct axial fans in the U.K. and Eire.

New Branch. Luxram Electric Ltd. have opened a new branch at 250 Ladypool Rd, Sparkbrook, Birmingham. Telephone South 2386. The area manager is Mr C. L. Douthwaite.

MEETINGS TO NOTE

SATURDAY, 11 JUNE

A.S.E.E. (Oxford). Annual meeting at Y.M.C.A., George St, 6 p.m.

MONDAY, 13 JUNE

A.S.E.E. (Central London). Annual meeting at St. Ermins Hotel, Caxton St, S.W.1, 6.15 p.m.

TUESDAY, 14 JUNE

A.M.E.M.E. Convention opens at Harrogate.

WEDNESDAY 15 JUNE

I.E.E. (S. Midland). Summer visit to Nottingham.

A.S.E.E. (Manchester). Country Night at Engineers' Club, Albert Sq, 7 p.m.

A.S.E.E. (Southampton). Annual meeting at Polygon Hotel, 7.15 p.m.

A.S.E.E. (S.W. London). Annual meeting at Guild Hse, Worple Rd, Wimbledon, 7.15 p.m.

THURSDAY, 16 JUNE

INSTN. OF PRODUCTION ENGRS. Conference on Automation.

A.S.E.E. (Watford). Annual meeting at Clarendon Hotel, 7.30 p.m.

W. T. Henley's Telegraph Works Co.

RECORD ORDER BOOK

THE seventy-sixth annual general meeting of W. T. Henley's Telegraph Works Company, Ltd., was held on June 3 in London.

Sir John Dalton, A.M.I.E.E., F.C.I.S., chairman, referred to the recent death of Mr. W. F. Bishop, C.B.E., the retirement of Sir Montague Hughman and the appointment of Mr Daniel Meinertzhagen to the board and in the course of his speech, said: Profit from trading was £905,649, a decrease to some three-quarters of the 1953 figure. The main cause lay in a number of factors which, fortunately, do not appear to be repeating themselves in this current year. We started the year 1954 with a depleted order book; in addition, the early part of the year was marked by a smaller volume of sales due mainly to the continued tendency to restricted buying by our largest customers.

The returns from our very large business in rubber cables were seriously affected by price increases of our raw materials. Also difficulties have been met in our export trade. The position today is that our Export Division is now dealing with an all-time record of enquiries for export business.

In the opinion of your board we should not get dismayed by these temporary adversities. Indeed, during 1954 we employed more capital in stocks and in other directions and our order book to date for the home market as well as for the export market for this current year discloses a record of orders greater than at any time in the company's history.

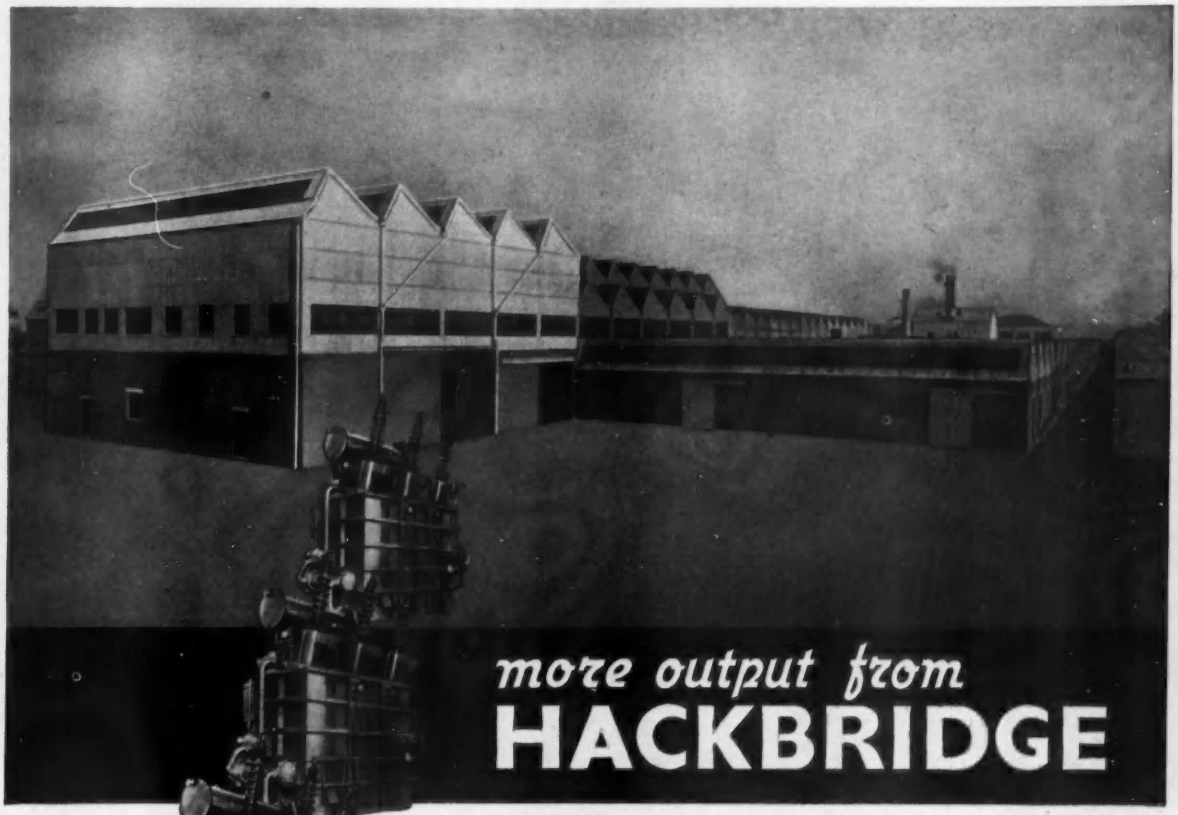
The net profit amounted to £491,000 to which is added the amount brought forward from 1953 of £820,000 making a total available profit of £1,311,000 compared with £1,506,000 for the previous year. We have transferred £100,000 to General Reserve and recommend the same rate of final dividend making 10½% again for the year on the Ordinary Stock, absorbing, with the Preference dividend, £296,000. In addition, it is proposed that a distribution out of capital profits should be made of 2% on the Ordinary stock. This is tax free.

Our current assets are £9,376,000 and, deducting the current liabilities of £2,948,000, the net current assets are £6,428,000.

The improvement reported to you last year in the position of Henley's Tyre and Rubber Co., Ltd., has been maintained and it is very pleasing for me to be able to report to you that the recovery in 1954 has enabled a profit to be earned and a dividend paid.

There has been a considerable improvement in demand during the latter part of 1954 and for the current year. Indeed, in 1954 we obtained many important contracts for power cables from the Area Board and Divisions of the Central Electricity Authority. We were also successful in obtaining substantial orders from the Admiralty and G.P.O.

We received noteworthy cable and overhead installation contracts which kept our home Contract Department fully employed during the year. Many valuable installation contracts were obtained from overseas customers during 1954. The current trading outlook justifies the belief that we can look forward with confidence to the future prospects of our company. The report was adopted.



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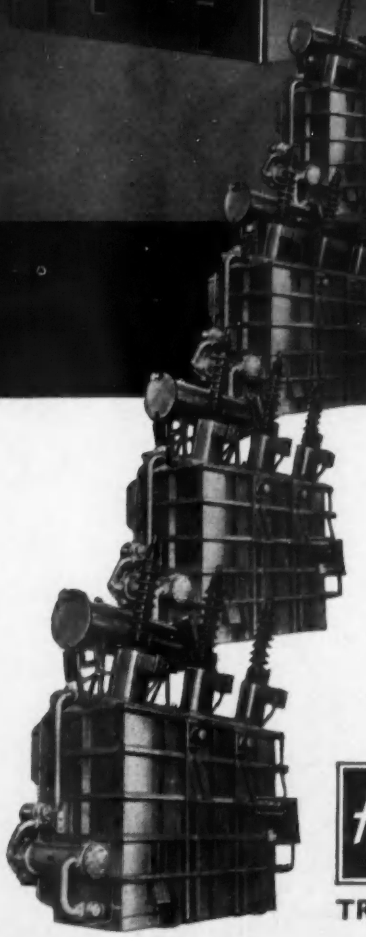

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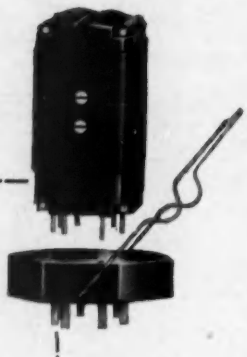

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SW/2

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

LOW VOLTAGE CABLES, ELECTRIC LIGHTING AND HEATING FOR CLUANIE DAM AND LOYNE TUNNEL POWER STATIONS

TENDERS are invited for the supply and installation of low voltage cables, electric lighting and heating services for the above-mentioned Power Stations. Copies of the Tender Document may be obtained on application with a cheque for £2. 2s. (returnable) to the Engineers, Messrs. Kennedy and Donkin, 12 Caxton St, London, S.W.1. The Board do not bind themselves to accept the lowest or any tender.

H. W. SIMPSON,
Secretary.
(T 129)

BOROUGH OF MACCLESFIELD

SODIUM DISCHARGE STREET LIGHTING HURDSFIELD ROAD, CUMBERLAND STREET AND KING EDWARD STREET

TENDERS are invited for the supply and erection of 80 sodium lighting units mounted on reinforced concrete columns.

Specification, Bill of Quantities and Form of Tender may be obtained from Mr J. H. Dossett, A.M.I.C.E., Borough Engineer, Town Hall, Macclesfield, on payment of a deposit of £2. 2s., to be returned on receipt of a bona fide tender.

Tender with completed Bill of Quantities, enclosed in plain sealed envelope, endorsed "Street Lighting—Hurdsfield Rd, etc.," to be delivered to the undersigned not later than noon on Friday, 1 July, 1955.

The Council do not bind themselves to accept the lowest or any tender.

WALTER ISAAC,
Town Clerk.
Town Hall,
Macclesfield.
4 June, 1955. (T 141)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

CENTRAL ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 61/55

APPLICATIONS invited for superannuable N.J.B. appointment of STATION SHIFT CONTROL ENGINEER at Carmarthen Bay Power Station.

Salary: K.10—£790 x £20 to £850.

H.N.C. and experience in power station control room desirable.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 24 June, 1955. (T 154)

THE ELECTRICITY CORPORATION OF NIGERIA

has the following vacancies on its staff in Nigeria.

All salaries carry, in addition, a generous expatriation allowance. Some posts are pensionable. Others are on Contract terms and are subject to an addition of 10% on the stated basic salary together with a gratuity payable on completion of satisfactory service and calculated at £37 10s. for each completed three months of service.

Free passages for man and wife and assisted passages or U.K. maintenance allowance for two children up to 18 years of age. Free quarters with basic furniture, low income tax, home leave on full pay. Candidates must pass a medical examination. Wives do not accompany their husbands on first appointment but follow shortly thereafter subject to accommodation being available. A clean and valid U.K. Driving Licence is essential.

ACCOUNTANTS. Qualified Accountants aged 25 to 35 years. Starting salary £920 and upwards to £1,300 according to age and experience. Posts are on contract terms for one or two tours.

ELECTRICAL ENGINEERS. Corporate members of I.E.E. for senior posts at salaries in range £760 to £1,300 with prospects of further advancement; and a few posts as Grade II Engineers, minimum qualification H.N.C., at salaries £985 to £1,090.

MECHANICAL ENGINEERS. Corporate members I.MECH.E., for senior posts and H.N.C. for Grade II posts; salaries as for Electrical Engineers above.

Application Forms and Conditions of Service from Liaison Officer, 11 Manchester Sq, London, W.1. (T 49)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

APPOINTMENT OF SECOND ASSISTANT DISTRICT ENGINEER (HAMILTON DISTRICT)

APPLICATIONS are invited for the above appointment in this Area.

The Salary and Conditions of Service relative to this appointment will be in accordance with the National Joint Board Agreement, Schedule A. The present Classification and Grading is E7. Salary £715/£760 per annum, which will be subject to the statutory deductions including superannuation.

Candidates should be Graduates of the Institution of Electrical Engineers or hold equivalent qualifications. They should have received a sound engineering training with subsequent experience in the operation and maintenance of H.V. and L.V. overhead and underground Distribution Systems, indoor and outdoor substations, testing and commissioning of Feeder Protection Systems, and H.V. fault location.

The successful Candidate for this appointment will require to reside within a reasonable distance of the Hamilton District Offices.

Application forms, which may be had from the undersigned, should be returned to this office within 14 days of the date of this notice.

DUGALD SMITH,
Manager.
137 Almada St,
Hamilton. (T 139)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Anglesey District of the Board's No. 4 Sub-Area based on Holyhead. Salary £595/£640 per annum (N.J.B. D/9).

Applicants should preferably have an engineering degree or its equivalent and have had experience of h.v. and m.v. overhead and underground distribution work.

The appointment is superannuable and subject to medical examination. Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date, 20 June, 1955. (T 130)

SOUTHERN ELECTRICITY BOARD

PLANNING ENGINEER

ISLE OF WIGHT District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 7 (£715 x £15—£760 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks and substations of all types operating at voltages up to 33,000 V. Applicants must possess technical qualifications to A.M.I.E.E. standard.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed not later than 30 June, 1955.

ASSISTANT ENGINEER (INSTALLATIONS)

Southampton District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class F, Grade 9 (£675 x £15—£720 per annum). N.J.B. Conditions of Service.

Applicants should have had experience of all types of electrical installations and should have a sound knowledge of I.E.E. regulations. The successful candidate will be required to supervise the work of installation inspectors and meter fixers.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him in envelopes suitably endorsed not later than 30 June, 1955.

ASSISTANT ENGINEER (LOCAL)

Reading District of No. 2 (Newbury) Sub-Area located at High Wycombe. Salary N.J.B. Class H, Grade 11 (£675 per annum rising to a maximum of £720). N.J.B. Conditions of Service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and distribution equipment, and possess suitable technical qualifications. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury, and returned to him in envelopes suitably endorsed not later than 30 June, 1955.

ENGINEERING DRAUGHTSMAN (MAINS)

No. 3 (Portsmouth) Sub-Area Drawing Office. Salary N.J.B. Schedule D, Grade 6 (£510 x £20—£630 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist in the preparation of specifications for overhead and underground mains and perform duties which will require technical calculations and a knowledge of mains and mains equipment in order to complete, under supervision, final or working drawings. Applicants should have a knowledge of overhead line construction and underground mains. The possession of technical qualification to H.N.C. standard would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed not later than 30 June, 1955.

The successful candidates for the above appointments will be required to contribute to the C.E.A. and Area Boards Superannuation Scheme, if eligible. (T 125)

LONDON ELECTRICITY BOARD

VACANCIES—ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for various vacancies within the Board. These posts are permanent and superannuable and are graded under Schedule D of the National Joint Board Agreement as Grade 6, £535. 10s./£661. 10s. per annum, inclusive of London Allowance.

South Eastern Sub-Area

DESIGN AND PLANNING BRANCH
AT WOOLWICH, S.E.18

Vacancy No. V/1973/T

Applicants should have had a good general and technical education in building construction and architecture, and experience in the design of small buildings in brickwork and reinforced concrete and the drawing up of specifications.

HAMPSTEAD/WILLESDEN DISTRICT
(DESIGN AND PLANNING)

Vacancy No. V/1972/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in mains records office dealing with systems of all voltages up to 11 kV.

North Eastern Sub-Area

(AT STRATFORD, E.15)

Vacancy No. V/1971/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: engineering drawings, plant lay-out in substations; layouts and site plans of mains work; electrical diagrams.

ST. MARYLEBONE/ST. PANCRAS DISTRICT
(DESIGN AND PLANNING)

Vacancy No. V/1967/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in mains records office dealing with systems of all voltages up to 11 kV.

Northern Sub-Area

DESIGN AND PLANNING BRANCH
(AT ALDERSGATE ST, E.C.1)

Vacancy No. V/1965/T

Applicants should preferably have had experience in mains recording with a public utility authority, preferably with an Electricity Board, and be able to obtain particulars on site and compile accurate permanent records. Some knowledge of electrical plant layout, building construction and simple reinforced concrete structures would be an additional advantage.

Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)

Vacancy No. V/1947/T

Candidates must have had a good general and technical education, up to National Certificate standard, and must be neat draughtsmen. They should be conversant with the layout of switchgear and transformers and associated equipment up to 11 kV for small substations. They should also be conversant with electrical diagrams, mains records, and similar work. Those with good experience in surveying and planning of mains networks would be considered even if having little experience of substation layouts.

North Eastern Sub-Area

WEST HAM DISTRICT

Vacancy No. V/1939/T

Candidates should have had a good general and technical education, up to Ordinary National Certificate standard. They should have had considerable experience in transformer chamber layout, mains records and system diagrams. Knowledge of building construction would be an advantage.

South Eastern Sub-Area

(AT WOOLWICH, S.E.18)

Vacancy No. V/1842/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, obtaining and recording all mains work and plant layout in transformer chambers.

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Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)

Vacancy No. V/1810/T

Candidates should have had a good general and technical education with experience of tracing, lettering, isometric and freehand drawings.

Application forms for these vacancies are obtainable from the Personnel Officer, 46/7 New Broad St, London, E.C.2. Please enclose addressed envelope and quote reference No. of vacancy preferred. (T 90)

CENTRAL ELECTRICITY AUTHORITY
Yorkshire Division

require a GENERAL ASSISTANT ENGINEER in the System Operation Department, Divisional Headquarters, Leeds.

Salary £475/£550 per annum, Class AX, Grade 7, rising to an ultimate maximum of £630 per annum, Class EX, National Joint Board Agreement.

Duties will be of a general statistical and technical nature in connection with system operation and control. Some knowledge of power station operation will be an advantage.

Application forms obtainable from Divisional Secretary (Establishments), Central Electricity House, St. Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(T 155)

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY
Aldermaston, Berks

requires TECHNICIANS, GRADE II and III for the following duties:

656/WGE/49, Technician, Grade II, to be responsible for the specification of components to be used in complex electronic equipment and to progress the production of such equipment by outside contractors. Applicants should have had extensive experience in the specification and inspection of electronic components and be capable of deducing from circuit diagrams the tolerances and working limits of the components required.

657/WGE/49, Technicians, Grade III, to work in a team engaged on the development of control systems making use of relays, uniselectors and audio-tone systems. Experience of the installation, maintenance and testing of automatic telephone exchanges and carrier telephony is desirable.

658/WGE/49, Technicians, Grade III, to work on complex electronic instruments, both in the laboratory and on field trial sites. The work involves the development of new circuit designs, installation of equipment on trial sites and maintenance and manning of the equipment during trials. Previous experience of the construction, testing and adjustment of complex electronic equipment is essential. Some experience in one or more of the following fields would be an advantage: V.H.F. transmission and reception. High Speed Pulse circuits, High Speed oscillography, Audio-frequency systems, Extra High voltage work. Successful applicants against 658/WGE/49, will be required to serve periods of duty overseas.

Applicants for all posts should have served a recognised engineering apprenticeship or have had equivalent training in an appropriate trade.

Salary. Technical Class Grade II, £710 (age 30) £830 per annum (male). Technical Class Grade III, £575 (age 26) £715 per annum (male).

Superannuation. The successful applicants will be required to join the Authority's contributory scheme.

Housing. Housing accommodation will be available within a reasonable period for married officers who live outside the radius of the Establishment's transport facilities or alternatively the Authority may be able to assist successful applicants in the purchase of a house. During this period a lodging allowance may be payable.

Requests for application forms by Post Card to Senior Recruitment Officer, A.W.R.E., Aldermaston, Berks. Quoting the appropriate reference number. (T 105)

SOUTH EASTERN ELECTRICITY BOARD

SENIOR ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Surrey Sub-Area Headquarters, Dorking

SALARY £1,195/£1,300 per annum in accordance with Grade 4, Class K, of the N.J.B. Agreement. Superannuable. Applicants, preferably Corporate Members of the I.E.E. should have extensive responsible experience of the operation and maintenance of main transmission circuits up to 33 kV, both underground and overhead, together with indoor and outdoor major substations and switching sites. The appointed person will be responsible to the sub-area engineer for the control, operation and maintenance of all main transmission and distribution, including system protection, within the sub-area.

Applications, naming 2 referees, on forms from C. W. Hughes, B.SC., M.I.E.E., Surrey Manager, SEEBoard, Rough Rew, Horsham Rd, Dorking, Surrey, by 22 June, 1955.

ASSISTANT DISTRICT ENGINEER
Swale District at Sittingbourne

Salary £555 x £15—£600 under N.J.B. Class E, Grade 11. Superannuable. Applicants should have had experience in the construction, operation and maintenance of E.H.T. and L.T., O/H and U/G systems with indoor and outdoor type substations and should hold a Higher National Certificate or its equivalent in electrical engineering. The person appointed will be required to reside in the district and accommodation is available.

Applications, naming 2 referees, to F. E. Fairbank, A.I.E.E., District Manager, SEEBoard, 88a High St, Sittingbourne, Kent, by 22 June, 1955.

JOINTERS (EXTRA HIGH TENSION)
Woking District

Wages 4s. 1d. per hour for 44-hour 5-day week under N.J.I.C. Agreement.

Applications, naming 2 referees, on forms from J. C. Poole, A.M.I.E.E., District Manager, SEEBoard, 4 Chobham Rd, Woking, by 22 June, 1955.

A. L. BURNELL,
Secretary.
(T 138)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

A FOURTH ASSISTANT ENGINEER is required in the Communications Section of the Technical Dept. N.J.B. service conditions, superannuable appointment, salary within Schedule C, Grade 6, commencing in range £600/£725, ultimately rising to £785 per annum.

Preference will be given to candidates who have had experience with tele-communications equipment, and the possession of a qualification equivalent to the Higher National Certificate in Electrical Engineering would be an advantage.

Apply, quoting Vacancy No. 962MD on form AE6 available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 30 June, 1955. (T 162)

BOROUGH OF ILFORD

BOROUGH ENGINEER'S DEPARTMENT

ONE ASSISTANT ELECTRICAL ENGINEER. Grade A.P.T. IV/V. Salary £675/£900 per annum plus London Weighting. The commencing salary will be fixed having regard to qualifications and experience. Candidates should preferably be A.M.I.E.E. or hold the Higher National Certificate for Electrical Engineering and have served an apprenticeship in this field. Applicants must have experience in the preparation of estimates, specifications, designs, drawings, supervision of work on site and testing in schools, public buildings, housing, pumping stations and street lighting

The Council is prepared to consider, if necessary, the provision of housing accommodation in connection with this appointment.

Appointment permanent, superannuable and subject to medical examination.

Application forms obtainable from the Town Clerk, Town Hall, Ilford, Essex, on receipt of stamped addressed envelope, should be returned not later than 25 June, 1955. (T 136)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

VACANCIES exist for a GENERAL ASSISTANT DISTRICT ENGINEER in the Fraserburgh and Peterhead Districts of the North Caledonia Area. Salary in accordance with N.J.B. F/9—F/7, £675/£800, with placing according to qualifications and experience.

Consideration will be given to applicants of little experience but with good technical background to train for the above position. Salary to commence in the range N.J.B. F/11—F/10, £595/£680.

Superannuation Scheme applicable. Applications, stating age, qualifications and experience, to be forwarded to the Area Manager, West Villa, Elgin, Morayshire, by 27 June, 1955. (T 163)

CENTRAL ELECTRICITY AUTHORITY
South Eastern Division

APPLICATIONS are invited for a SECOND ASSISTANT ENGINEER to take charge of the Croydon District of the Transmission Department, based at Croydon "B" Power Station. Applicants, who should preferably be Corporate Members of the Institution of Electrical Engineers, should have had extensive experience in construction and operation of E.H.V. transmission equipment and experience in Joint Consultation and Conciliation. Evidence must be produced of administrative ability. N.J.B. Conditions of Service Class AX/DX Grade 2, £950/£1,075/£1,165 per annum, plus London Allowance. Applications giving details of education, present position, experience, etc., should be forwarded to the Establishments Officer, Central Electricity House, Lower Ham Rd, Kingston-on-Thames, to arrive by 18 June. (T 153)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER
(METERS, TESTING AND PROTECTION)

APPLICANTS should have experience in the testing and commissioning of substation equipment, protective gear maintenance and testing, applied high voltage tests, fault location and high voltage system calculations. Candidates should have technical qualifications up to Higher National Certificate in Electrical Engineering as a minimum.

Salary—N.J.B. Class M, Grade 13, £755/£15/£800 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 23 June, 1955. (T 132)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the position of FOURTH ASSISTANT ENGINEER, Telecommunications, based at the Regional Technical Office, Leicester.

Applicants should be thoroughly familiar with automatic telephone type equipment and circuitry and should have experience of V.F. signalling. A knowledge of carrier communications and power system supervisory equipment would be advantageous.

Candidates should have a good general education and be in possession of suitable technical qualifications.

Salary will be in accordance with Class AX/DX, Grade 6 (£600/£785 per annum) of the National Joint Board Agreement and the position will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by 16 June, 1955. Please quote Vacancy Number 86/55/ET.

L. F. JEFFREY,
Divisional Controller.

24 May, 1955. (T 42)

CENTRAL ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for a post as

ASSISTANT SHIFT CHARGE ENGINEER
POOLE GENERATING STATION
S/13.668

Applicants should have had previous experience in a large modern generating station, and preference will be given to those with experience of high operating temperatures and pressures, and pulverised fuel equipment. Manufacturing works experience will be an advantage.

Preference will be given to those who possess qualifications leading to corporate membership of a recognised professional institution.

Salary N.J.B. Grade J.9, £790/£850.

Special application forms obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 22 June. Please quote reference E.R. (T 157)

AIR MINISTRY

require STATION ENGINEERS (G.D.) and STATION ENGINEERS (MECH.) at Royal Air Force and Ministry of Transport and Civil Aviation stations. Qualifications required (*a*) Ordinary National Certificate in Electrical or Mechanical Engineering or show that an equivalent standard of technical education has been reached; (*b*) recognised apprenticeship in electrical or mechanical engineering with firm or establishment of good repute; (*c*) three years' employment in electrical or mechanical engineering preferably on operation and maintenance of mine, factory or workshop plant and services. Preference will be given to applicants who have had supervisory duties subsequent to (*b*) and (*c*). Work will consist of installation, operation and maintenance of high and medium voltage electrical distribution systems, electrical installations, generating plant, steam and hot water heating systems and miscellaneous works plant, tools and equipment. Commencing salary according to age, qualifications and experience on range from £535 to £772. Liability for tours of duty overseas for which special allowance payable in addition to higher salary. Appointments non-pensionable. Only natural-born British subjects. Write, giving age, full details of qualifications and experience to AB.1255, Appointments Officer, Ministry of Labour and National Service, 1-6 Tavistock Sq, W.C.1. No original Testimonials should be sent. Only candidates selected for interview will be advised. (T 117)

MIDDLESEX COUNTY COUNCIL
County Architect's Department

ELECTRICAL ENGINEERING ASSISTANT, Grade IV (£675/£825 per annum plus London Weighting). Appointment to grade minimum. Established, subject to medical assessment and prescribed conditions. Able to prepare plans and specifications; practical experience in wiring installations in large buildings and design of electrical schemes. Should hold Higher National Certificate in electrical engineering. Applications Forms (stamped addressed foolscap envelope) from County Architect, 1 Queen Anne's Gate Buildings, Dartmouth St, S.W.1, returnable by 20 June (quote Q.622.ET). Canvassing disqualifies. (T 127)

EASTERN ELECTRICITY BOARD

SUB-AREA MANAGER—ESSEX SUB-AREA
104/55.R

APPLICATIONS are invited to fill the vacancy arising from the appointment of Mr R. H. M. Barkham as Chief Commercial Officer to the Board.

The appointment is superannuable and the salary will be in accordance with Scale 3 of the Sub-Area Managers' Scales of the National Joint Managerial and Higher Executive Grades Agreement, plus London Weighting (£2,350—£2,600).

Applications to reach the Secretary, Eastern Electricity Board, P.O. Box 40, Wherstead, Ipswich, Suffolk, by first post 21 June, 1955. (T 126)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (Construction) required in the Chief Engineer's Department, Board Headquarters, Electricity House, Love Lane, Liverpool 3. Salary within range £950/£1,165 per annum in accordance with N.J.B. Grade 2, AX/DX with an initial placing according to qualifications and experience.

Appointment superannuable and subject to medical examination.

Applications stating technical qualifications and experience should be forwarded to the Establishments Officer at the above address. Closing date, 20 June, 1955. (T 135)

NORTHAMPTON POLYTECHNIC
London, E.C.1

APPLICATIONS are invited for full-time ASSISTANT LECTURER in the Electrical Engineering Department. Candidates should possess University Degree in Engineering or equivalent qualification and have had practical experience in the Electrical industry. Post offers experience in advanced work with scope for research and development.

Salary in accordance with the London Technical Burnham Scale, Grade B, viz.: £525 by £25 to £820 with allowance of £60 for graduates or equivalent and up to £54 for training, plus London allowance of £36 (£48 if over 37) plus up to twelve increments of £18 for industrial experience after the age of 21.

Particulars and form of application from Secretary. (T 123)

MIDLANDS ELECTRICITY BOARD
Central Gloucestershire Sub-Area

APPLICATIONS are invited for the following superannuable posts:

THIRD ASSISTANT DISTRICT ENGINEERS (TWO)

(Gloucester District)

Applicants should have a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. Salary £635/£680 per annum (N.J.B. E.9).

Apply, in writing, within fourteen days, stating age, qualifications, experience, together with details of present position and salary to District Manager, Midlands Electricity Board, Commercial Rd, Gloucester.

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER

(Severn Vale District—Chipping Sodbury)

Duties will include development of Agricultural and other Heavy Duty sales and service. Experience essential. Technical qualifications desirable. Salary £595/£640 per annum (N.J.B. Grade E.10).

Apply, in writing, within fourteen days, to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester.

A. STEPHENS,
Secretary.
(T 158)

CENTRAL ELECTRICITY AUTHORITY
Yorkshire Division

APPLICATIONS are invited for the appointment of BOILER HOUSE SUPERINTENDENT at Ferrybridge Power Station, nr. Knottingley.

Salary £900/£975 per annum, Class H, Grade 6, N.J.B. Agreement.

Applicants should have had a sound technical training and experience in the operation of a large power station, and preference will be given to candidates who are Corporate or Graduate Members of the Institution of Mechanical Engineers or who hold equivalent qualifications.

Application forms obtainable from Divisional Secretary (Establishments), Central Electricity House, St. Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(T 104)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Lanarkshire Area

(1) TWO CABLE JOINTERS FOR NEWLANDS DISTRICT.
(2) ONE CABLE JOINTER FOR RUTHERGLEN DISTRICT.
(3) ONE FITTER (ELECTRICAL) FOR THE TRANSFORMER TESTING DEPARTMENT, MOTHERWELL.

APPLICATIONS are invited for the above vacancies. Applicants for Vacancies Nos. 1 and 2 should have had experience in plumbing and jointing E.H.V. and L.V. lead covered, paper insulated cables. Applicants for Vacancy No. 3 should have served a recognised apprenticeship followed by experience in electrical repairs to plant.

The Rate of Wages and Working Conditions will be in accordance with the National Joint Industrial Council's Agreement for the Electricity Supply Industry. The present rate of wages for the above vacancies will be 4s. 1d. per hour for a 44-hour, 5-day week.

Application forms, which may be had from the undersigned, should be forwarded to this office within 14 days of the date of this notice.

DUGALD SMITH,
Manager.
137 Almada St,
Hamilton. (T 133)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

DEPUTY STATION SUPERINTENDENT
DERBY POWER STATION
Vacancy No. 94/55/ET

Candidates should have a wide experience in the operation, maintenance and administration of an electricity generating station and a knowledge of Pulverised Fuel Firing will be an advantage.

The possession of technical qualifications admitting to Corporate Membership of a recognised professional institution will be an advantage.

Salary will be within Class F, Grade 3 (£975 x £25—£1,050 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 27 June, 1955.

SHIFT CHARGE ENGINEERS
CASTLE DONINGTON POWER STATION
Vacancy No. 81/55/ET

Applicants must have had operating experience with high pressure turbo-alternators and pulverised fuel fired boilers.

Possession of technical qualifications admitting to Corporate Membership of the Institution of Mechanical and/or Electrical Engineers and also proof of indentured apprenticeship will be an advantage.

Salary will be in accordance with Class L, Grade 7 (£1,035 x £30—£1,125 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 27 June, 1955.

GENERAL ASSISTANT ENGINEER (CHEMIST)
DRAKELOW POWER STATION
Vacancy No. 92/55/ET

Applicants should possess Intermediate B.Sc. or Ordinary National Certificate in Chemistry and have experience of general chemical analysis. A knowledge of fuel and water analysis would be an advantage.

Salary will be in accordance with Class J, Grade 16 (£515 x £15—£560 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 27 June, 1955.

GENERAL ASSISTANT ENGINEER, NORTH WILFORD POWER STATION, NOTTINGHAM
Vacancy No. 93/55/ET

The duties of this position are mainly to assist in the Station Control Room on shift, and to carry out such other operation and investigation duties as may be required.

Applicants should have had some previous experience in a Generating Station and preference will be given to those who hold the Higher National Certificate, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class K, Grade 15 (£595 x £15—£640 per annum) of the National Joint Board Agreement.

continued in next column

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Closing date for receipt of applications, 27 June, 1955.

TWO SENIOR DRAUGHTSMEN (ELECTRICAL)
GENERATION (CONSTRUCTION)
DEPARTMENT
Vacancy No. 97/55/ET

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with Grade 5 (£640 x £20—£740 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 27 June, 1955.

TWO SENIOR DRAUGHTSMEN (MECHANICAL)
GENERATION (CONSTRUCTION)
DEPARTMENT
Vacancy No. 96/55/ET

Candidates should have experience on one or more of the following:

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary will be in accordance with Grade 5 (£640 x £20—£740 per annum) or Grade 4 (£750 x £20—£850 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 27 June, 1955.

SENIOR ASSISTANT
DIVISIONAL ACCOUNTANT'S DEPARTMENT
Vacancy No. 98/55/ET

Senior Assistant required in the Costing and Financial Accounts Section. Candidates should possess a recognised Accountancy qualification.

Salary will be within Grade 5 (£720 x £25—£795 per annum) of the National Joint Council Agreement.

Closing date for receipt of applications, 22 June, 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number

L. F. JEFFREY,
Divisional Controller.
(T 128)

YORKSHIRE ELECTRICITY BOARD
No. 7 (Grimsby) Sub-Area

Scunthorpe District
DISTRICT COMMERCIAL ENGINEER
Vacancy No. 53/55

CANDIDATES must be capable of conducting the development of a District, supervising a District Commercial Organisation and have sound experience covering:

(a) Consumer service.
(b) Industrial and Commercial Development of Electricity Supply.
(c) Control of Service Centre Sales and Staff.
(d) Control of electrical contracting and maintenance department and Staff.
(e) Administration and operation of hire and hire purchase schemes.
(f) Consumers Records.

Appropriate technical qualifications would be an advantage.

Salary—N.J.B. Class F, Grade 4, £900/£25/£975 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 23 June, 1955. (T 131)

CENTRAL ELECTRICITY AUTHORITY
North West, Merseyside & N. Wales Division

VACANCY NO. E.50/188/T—MAINTENANCE ENGINEER (Electrical) at Bromborough Generating Station. Salary £900/£975 (H.6).

Applications to Divisional Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20, before 23 June. Quote vacancy No. (T 137)

CENTRAL ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following posts:

STATISTICAL ASSISTANTS
DIVISIONAL ACCOUNTANT'S DEPARTMENT
S/13.669

Assistants (male or female) are required for the statistical section within the Divisional Accountant's Department at Portsmouth. Applicants should preferably be university graduates with some knowledge and experience of the application of Statistical Methods. These are interesting positions giving opportunities to gain experience in the Electricity Supply Industry.

Salary N.J.C. Grade 2 £525/£585.
Grade 3 £585/£645.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 27 June. Please quote reference D.T. (T 156)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Chief Engineer's Department, Meters Section, Ellison Place, Newcastle upon Tyne.

Applicants should hold Higher National Certificate in electrical engineering or equivalent qualification. N.J.B. Conditions of service.

FOURTH ASSISTANT ENGINEER. Applicants should have had experience in testing and maintenance of polyphase metering equipment and associated instruments. Salary—Schedule C, Grade 6—£600/£785.

GENERAL ASSISTANT ENGINEERS—Salary—Schedule C, Grade 7, £475/£610.

Applications stating age, qualifications and experience to be received by the Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (T 140)

CENTRAL ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

STATION SHIFT CONTROL ENGINEER
ST. MARYLEBONE GENERATING STATION
Vacancy No. 55/417

Practical experience in Control Room Operation necessary. Salary—Class E, Grade 10=£624. 15s. per annum.

Applications, quoting vacancy number, may be made on the standard form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (T 122)

A VACANCY has arisen on the staff of The General Electric Co., Ltd., at their Head Office, for an ESTIMATOR who has had training and experience in installation layout, also in the preparation of schemes for under-floor ducting, busbar and cable trunking. Applications will be considered from men up to 45/50 years of age. Apply in writing, giving full details, and quoting ref. BD, to the Staff Manager, Magnet House, Kingsway, London, W.C.2. (T 110)

ARMATURE WINDER-CHARGEHAND required for supervision of male and female labour on small repairs, must be experienced A.C./D.C. The repair shop is situated in the Midlands.—Box No. 4583, Electrical Times. (T 164)

THE ENGLISH ELECTRIC COMPANY, LIMITED,

at Stafford

have the following vacancies in their Meter and Relay Department.

SENIOR RELAY ENGINEER having wide experience of protective relays, for important work in a rapidly expanding section. University degree or H.N.C. standard is essential for this position.

RELAY SALES AND CONTRACTS ENGINEER. Young men interested in this field of electrical engineering, preferably with some experience, although this is not essential since training will be offered to otherwise suitable candidates. Minimum technical qualifications of O.N.C.

METER ENGINEER. Young men preferably having either manufacturing or testing experience are required for the Development Laboratory and Design Section of this Department. Technical qualifications preferably H.N.C. although consideration would be given to a young engineer with wide practical experience and of O.N.C. standard.

All the posts offered are permanent, progressive and pensionable. Applications should be sent to Dept. C.P.S., 336/7 Strand, W.C.2,

quoting Ref. 1366B.

(T 113p)

A VACANCY occurs in the Transformer Department for a TECHNICAL CORRESPONDENT and ESTIMATOR. The post is a senior one and applications are invited from men with experience in the preparation of tenders for both the home and export markets for all classes of transformers. Apply giving details of experience and salary required to Employment Manager, Messrs Johnson and Phillips Ltd., Victoria Way, Charlton, London, S.E.7. (T 35)

ASSISTANT required, having a broad knowledge of the uses of Electricity in Agriculture. Starting salary, according to qualifications, within the appropriate scale (£550/£775 per annum). Apply—Box No. 4575, Electrical Times. (T 120)

A LEADING firm in the Lighting Industry has a vacancy for a first class DESIGNER in its Lighting Department. Work will be concerned with special decorative fittings designs in both contemporary and traditional styles, and new lighting developments. The post offers attractive prospects and salary for men with initiative, imagination, and a sound experience in this field. Apply in writing quoting Ref. D.O. to the Staff Manager, The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. (T 33)

CABLE JOINTERS and CABLE JOINTERS MATES required by North London Electrical Contractors. Apply—Box No. 4565, Electrical Times. (T 99)

DRAUGHTSMEN required for work on all types of Transformers, up to 3,000 kVA including Regulators, Test Equipment, Cubicles, etc. Good conditions. Apply in writing to Personnel Officer, Foster Transformers Ltd., South Wimbledon, S.W.19. (T 27)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

DRAUGHTSMEN for Low Voltage Electrical Distribution Equipment including Joint Boxes and Terminations. 5-day week. Pension Fund. Apply in writing, stating age, details of experience and salary expected, to the Personnel Officer, W. T. Henley's Telegraph Works Co., Ltd., Gravesend. (T 30)

DRAUGHTSMEN required, Electro-Mechanical work of varied nature. Knowledge of circuitry an advantage but not essential. Salary in accordance with age and experience. Pension Scheme. Write giving details of experience, etc. (quoting ref. STK 2), The General Electric Co., Ltd., Union Works, East Lane, Wembley, Middx. (T 159)

DESIGNER required with experience, particularly of small mechanisms. Electrical qualifications desirable, excellent prospects. Applications in confidence stating experience, age and salary required, to Managing Director, Wandsworth Electrical Manufacturing Co., Ltd., Albert Drive, Sheerwater, Woking, Surrey. (T 148)

ELECTRICAL Engineers require ASSISTANT CONTRACTS MANAGER, applicants must have previous experience of managing large and varied contracts of all kinds. Write giving details of experience and salary required to—Box No. 4561, Electrical Times. (T 66)

ELECTRICAL Appliance Testing Laboratory requires YOUNG MAN having completed National Service to train as Junior Test Engineer. Minimum qualifications National Certificate in Electrical Engineering or Applied Physics. Apply British Electrical Development Association, E.D.A. Testing House, Cleeve Rd, Leatherhead. (T 124)

ELECTRICAL MOTOR DESIGNER required by centrifugal pump manufacturers. Must be experienced in the design and development of medium-sized A.C. and D.C. machines, submersible-type motors, etc. Excellent opportunity for qualified, enthusiastic and practical man to improve established and internationally-known machines, and to introduce new ideas. The post is one of responsibility and salary will be in accordance. Please send full details including age, qualifications, experience and suggested salary to the Box Number quoted below. Applicants may be assured that their replies will be treated as fully confidential. —Box No. 4579, Electrical Times. (T 151)

ELECTRICAL DRAUGHTSMEN—Senior and Junior—required for design and detail of large industrial and chemical projects. Applications, giving details of technical training and office experience, to George Wimpey and Co., Ltd., Mechanical Division, 27 Hammersmith Grove, London, W.6. (T 114)

EXPERIENCED MAN or WOMAN wanted by big manufacturing firm to take charge and build up, domestic and decorative lighting fittings sales department. Fine opportunity for the right person. Considerable scope. Replies treated in confidence.—Box No. 4587, Electrical Times. (T 166)

ELECTRONIC DESIGNER

There is a vacancy on the staff of the BRITISH ELECTRICAL AND ALLIED INDUSTRIES RESEARCH ASSOCIATION for an electronic designer to work on specialised equipment for steady state and transient operation in the audio and supersonic frequency range. The appointment, which offers wide scope for initiative and inventiveness, may be permanent or for a period of two years, and is suitable for a young engineer wishing to broaden his experience. Apply to:

The Director, E.R.A. Laboratories, 5 Wadsworth Rd, Greenford, Middx.

(T 150p)

THE ENGLISH ELECTRIC COMPANY, LIMITED,

at Stafford

invite applications for positions as

SALES OR CONTRACTS ENGINEERS

in their Rectifier Department.

Applicants should have completed National Service and served an apprenticeship in the electrical manufacturing industry.

The minimum technical qualification acceptable is H.N.C. in Electrical Engineering.

Some experience with Mercury Arc Rectifiers would be an advantage, but is not essential. The work is interesting and varied, dealing with the application of Rectifiers in many industries and to railway electrification.

The positions carry good salaries, are permanent, progressive and, following a probationary period, come within the scope of the Company's pension scheme.

Reply with full personal particulars to Dept. C.P.S., 336/7 Strand, W.C.2,

quoting Ref. 1230B.

(T 112p)

ENGINEERS or PHYSICISTS required for development of new types of X-ray tubes and rectifiers. Preference will be given to persons from 25 to 30 years of age with some experience of similar equipment. Positions are progressive and pensionable; salary according to age and qualifications. Applications giving full details of qualifications and experience should be made to: Metropolitan-Vickers Electrical Co., Ltd., X-Ray Engineering Dept., 68 Ballards Lane, London, N.3. (T 111)

ELECTRICIANS. G. R. Marson Limited, 110-116 Queen Victoria Rd, Coventry, require a number of electricians for long term contracts. (T 96)

ENGINEER SURVEYOR for inspection of Crane and other lifting plant required. Commencing salary £600 per annum rising to £850 after ten years. Pension (non-contributory). Experience in construction and design of Cranes essential. H.N.C. desirable. Apply: Manager, Engineering Department, General Accident Assurance Corpn., 99 Aldwych, W.C.2. (T 109)

JOHNSON AND PHILLIPS LTD.

CABLE WORKS MANAGER

Johnson and Phillips Ltd. require a Manager for their Paper and Rubber Cable Works. Those interested should send full details of their training and career to the Managing Director. All correspondence will be treated in absolute confidence.

Johnson and Phillips Ltd., Charlton, London, S.E.7.

(T 85p)

CAPACITOR DEPARTMENT

ENGINEER for Design and Development of Power Capacitors and ancillary apparatus.

SALES ENGINEER for London and S.E. England.

DRAUGHTSMAN, preferably with some experience with Power Capacitors.

Apply:

Technical Director,
Bryce Electric Construction Co., Ltd.,
Kelvin Works,
Hackbridge, Surrey.
(T 31p)

ENGINEER with varied rather than specialised electrical experience is required as editorial assistant with technical journal (London area). Candidates should possess a degree or H.N.C. Apply, giving full details of training, qualifications and experience, to—Box No. 4591, Electrical Times. (T 168)

FOREMAN LINESMAN required for Wood Pole Distribution Scheme in Inverness Area. High Rates paid. Good Conditions. Apply by letter to B. French Ltd., Pike Mills, Green St, Kidderminster. (T 146)

FORD MOTOR COMPANY LIMITED, Dagenham, Essex, require a LENS DESIGNER.

Applications are invited from Designers—not necessarily in the Motor Industry—with experience in photometrics, tests, materials, finishes, etc., who are prepared to adapt their experience to Motor Vehicle Lighting.

The position, which is permanent and pensionable (non-contributory Superannuation scheme), is a responsible one and a salary commensurate with such responsibilities will be offered.

Early consideration will be given to applications, which should contain brief details of experience and quote ref. VCL/3, and be addressed to the Salaried Personnel Department. (T 108)

MANAGER required, preferably with electrical or civil engineering training, eventually with some chemical experience to take charge of well-established business in full activity with office in London. The company specialises in the maintenance of electrical transmission lines and particularly in the reimpregnation of wood poles already implanted. The process is patented and extensively used in Great Britain and all other countries on the Continent and in America. It prolongs the life of wood poles considerably. The applicant must have administrative qualifications and sales experience and be able to follow contacts with the Electric Supply Companies, the G.P.O. and Railways. Age—40 to 45. The Manager will be responsible for site work and will be required to undertake a considerable amount of travelling. This appointment offers an interesting position with an assured future to the right man. Write giving full details of experience, copies references and salary to—Box No. 4563, Electrical Times. (T 86)

CABLE INSTALLATION STAFF FOR SINGAPORE

(*a*) ASSISTANT CONTRACT ENGINEER to supervise cable installation contracts.

(*b*) FOREMAN/JOINTER for cabling up to and including 22 kV cables.

The above staff are required for work in Singapore and Malaya. Engagement on a 3 year agreement. Salary according to qualifications and experience. Bachelor quarters provided free.

Applicants should be unmarried and please apply giving full details to:

Box No. 4581, Electrical Times.
(T 152p)

INSTRUMENT TECHNICIAN for public utility in Maracaibo, Venezuela. Must be competent to service pneumatic instruments and controls; also electronic instruments. Initially two-year contract in modern high pressure steam plant. Real opportunities for advancement to candidate interested in general power plant work. Good starting salary; fringe benefits with living accommodation provided. Applicant should provide full personal and technical background to: Mackness and Shipley, Parliament Mansions, Abbey Orchard St, London, S.W.1. (T 165)

INTERNATIONAL Group operating Oil Industry in Persia have a vacancy for an ARMATURE WINDER who is capable of carrying out repairs and rewinds on machines up to 600 h.p. at 3·3 kV and also capable of teaching others.

The above position is a two-year appointment and carries a very attractive salary. Married accommodation is available and family passages will be paid. Applicants, preferably between 30 and 45, should write giving brief details for Application Form to Box E.T.556, c/o 191 Gresham House, E.C.2. (T 145)

POWER CABLE ENGINEERS required with experience of all types of cable installation work including overhead power lines; a knowledge of railway electrification would be an advantage. The appointments will be for contract work either at home or overseas. Position permanent with contributory pension scheme. State age, qualifications, experience and salary required. London area.—Box No. 4559, Electrical Times. (T 65)

REQUIRED: TECHNICAL ASSISTANTS with good general experience of electrical installation work. Salaries according to qualifications and experience. Application form (returnable within 14 days) from Chief Engineer (55/32), London County Council, County Hall, S.E.1. (T 106)

SALES LIGHTING ENGINEER, for sale of "Thorlux" Lighting Equipment, Lancashire area. Previous experience essential. Good salary and expenses. Apply F. W. Thorpe Ltd., Welby Rd, Hall Green, Birmingham 28. (T 144)

SALES ENGINEER to call on Architects, Consultants, Surveyors, etc., in Yorkshire and North East Coast area. Remuneration commensurate with the high qualities this position demands. Car provided, expenses paid, superannuation scheme in operation. Applications should be addressed for the confidential attention of Mr H. Finch, director, Volex Electrical Products Ltd., Salford, 6. (T 84)

SALES ENGINEER for East Midlands, for sale of E.H.T. and L.T. Switchgear, Transformers, Power Factor Improvement Capacitors, Instruments, Thermal Storage Heating Installations. H.N.C. essential. Apply—Box No. 4593, Electrical Times. (T 169)

SALES LIGHTING ENGINEER, for sale of "Thorlux" Lighting Equipment, Yorkshire area. Previous experience essential. Good salary and expenses. Apply F. W. Thorpe Ltd., Welby Rd, Hall Green, Birmingham 28. (T 143)

SENIOR ELECTRICAL ENGINEER required by old-established Company manufacturing special purpose control gear for multi-motor drives. Applicant should preferably have degree and/or membership of the Institute of Electrical Engineers. Position of high executive status controlling existing staff and responsible to directors. Pension Scheme and housing assistance, if required. Write to—Box No. 4589, Electrical Times. (T 167)

SKILLED OVERHEAD LINESMEN required for Wood Pole Distribution Scheme in Inverness Area. Good Pay and Conditions. Apply by letter to B. French Ltd., Pike Mills, Green St, Kidderminster. (T 147)

SALES ENGINEER to call on Architects, Consultants, Surveyors, etc., for Midlands area. Remuneration commensurate with the high qualities this position demands. Car provided, expenses paid, superannuation scheme in operation. Applications should be addressed for the confidential attention of Mr H. Finch, director, Volex Electrical Products Ltd., Salford, 6. (T 83)

TECHNICAL ASSISTANTS required to act in Research, Development, and Inspection Problems in modern Switchgear factory. Applicants must have Science, Engineering Degree or Diploma. Housing assistance can be given to successful applicants. Write giving particulars of experience and qualifications to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (T 149)

TECHNICAL WRITER required by large precision instrument Company with offices in Leyton.

Applicants should be familiar with Electronics and Mechanics and able to write technical service literature. The position can be progressive for the right man and the initial salary would be commensurate with experience.

Applications, which can be made in the strictest confidence, giving full details of experience, age and salary required, should be addressed to The Personnel Manager, Kelvin and Hughes Limited, New North Rd, Barkingside, Essex. (T 98)

TECHNICAL ASSISTANTS required to act in Research, Development, and Inspection Problems in modern Switchgear factory. Applicants must have Science, Engineering Degree or Diploma. Housing assistance can be given to successful applicants. Write giving particulars of experience and qualifications to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (T 63)

YOUNG MAN required for Sales Office and Showroom. Knowledge of Electric Lighting fittings essential. Please apply: Fredk. Thomas and Co., Ltd., 18/26 Everton Buildings, Stanhope St, N.W.1. EUS 4111. (T 142)

YOUTH required, electrical contractor's office, accounts department. Good opportunity for lad just left school. Write giving age, details of education and salary required to Alliance Electrical Co., Ltd., 2 Henrietta St, W.C.2. (T 107)

APPOINTMENTS WANTED

NOW in Pakistan: BRITISH ELECTRICAL ENGINEER, 37, B.SC.(ENG.), A.M.I.E.E., experienced power station commissioning, estimating and supervision of switchgear and cable installation contracts. Shortly available.—Box No. 4519, Electrical Times. (T 21)

SALES EXECUTIVE, C.M.A., with excellent contacts Midlands Area, wishes to meet Manufacturer with view to similar appointment.—Box No. 4573, Electrical Times. (T 115)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (T 3)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (T 4)

METALWORK. All types cabinets, chassis, racks, etc., to your own specification. Philpotts Metalworks Ltd., Chapman St, Loughborough. (T 119)

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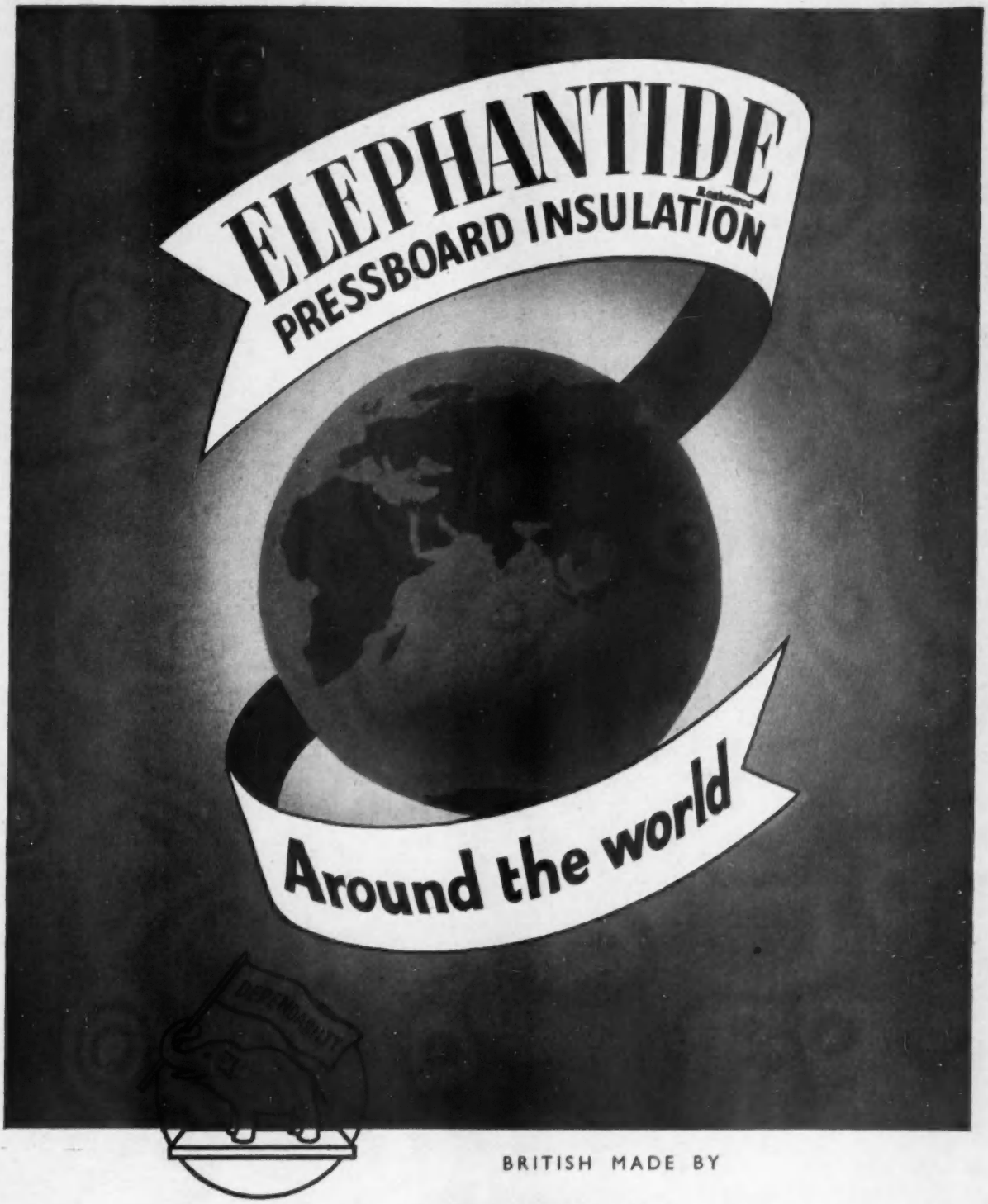

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INDUSTRIAL and DOMESTIC MOTOR REWINDS and REPAIRS speedily carried out. All work guaranteed. N. France Electronics Ltd., 110 New Road Side, Horsforth, Leeds. Horsforth 2871. (T 6)

LET US SOLVE YOUR BREAKDOWN PROBLEMS, repairs speedily carried out by experts. Collection and Delivery by our own transport. A. T. Robinson, Electrical Power Engineers, The Green, Southall, Middx. Southall 3494/5/6. (T 5)

WANTED

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (T 2)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (T 1)

BUSINESS OPPORTUNITIES

EXTRUSIONS BY MARLEY

Buyers requiring rigid and flexible tubes and sections in thermoplastic materials should ask for a quotation from Marley Extrusions, Dept. 123, Lenham, Maidstone, Kent. Harrietsham 381. (T 116p)

FOR SALE

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (T 7)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi. 5105, 67 Rothschild Rd, W.4. (T 8)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (T 9)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Cowal Area

ELECTRICAL EQUIPMENT FOR SALE

OFFERS are invited for the following Electrical Equipment at Rothesay Power Station:

1—D.C. Ampere Hour Test Equipment.
1—D.C. Milliammeter.
2—Dial test Ampere Hour Meters.
1—Meter test bench complete.
1—Meter test bench incomplete.
335—Credit House Service Meters.
64—Prepayment House Service Meters.
65 lb.—Mercury.

Details, Form of Offer and permission to view may be obtained on application to the Area Manager, 6 Queen St, Rothesay. Offers will be received up to 22 June, 1955. The Board are not bound to accept the highest or any offer. (T 161)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. specification 214 or individual requirements.—Blickvac, Hamilton Rd Works, Hamilton Rd, S.E.27. Tel. Gipsy Hill 4394. (T 14)

DON'T WORRY about your ELECTRICITY BILLS. Fit 1s. slot electric meters for hotels, bedsitters, etc. Prices from 50s. Selectrics Department E.T., Castle Circus House, Torquay. Phone 7218. Trade enquiries invited. Trade discount. (T 16)

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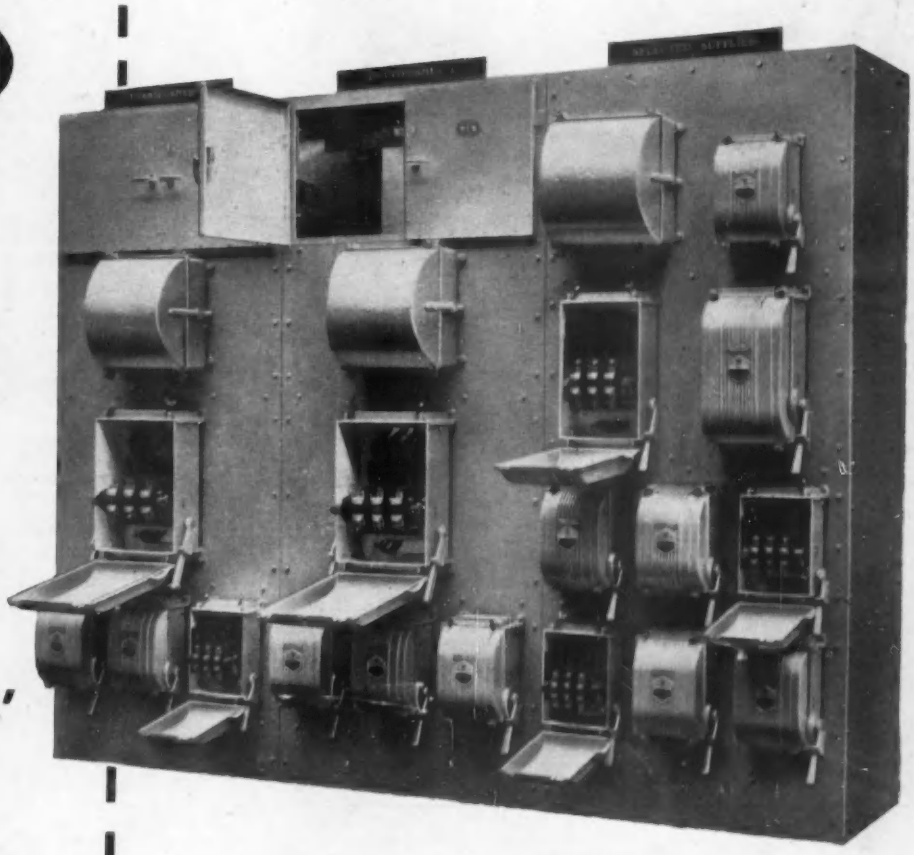

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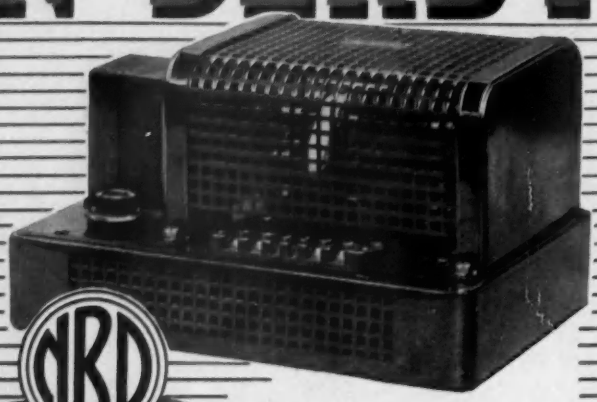

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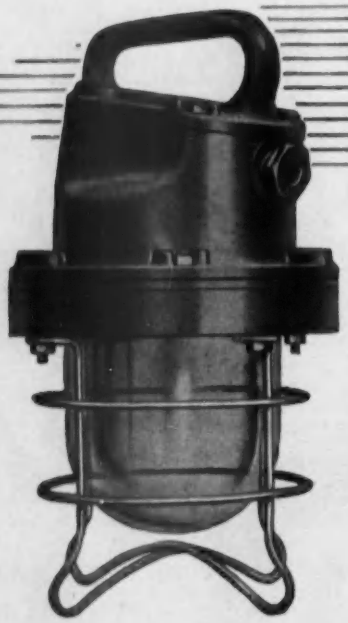

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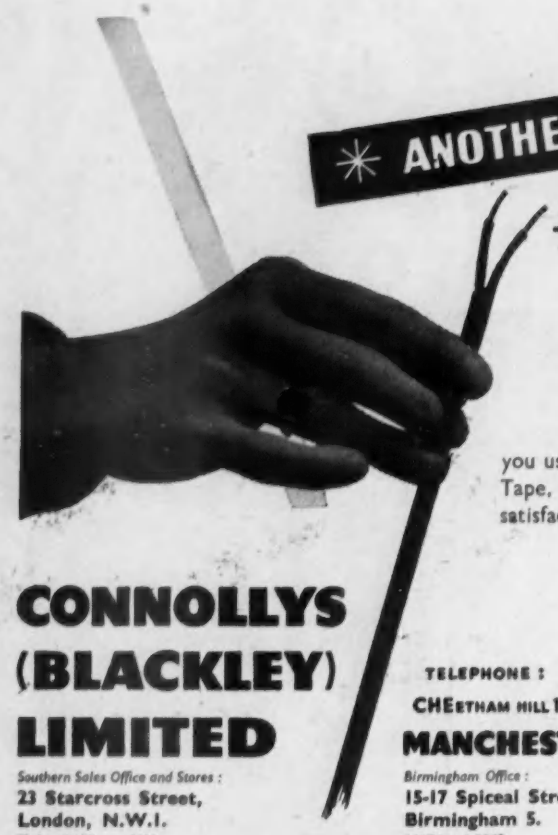

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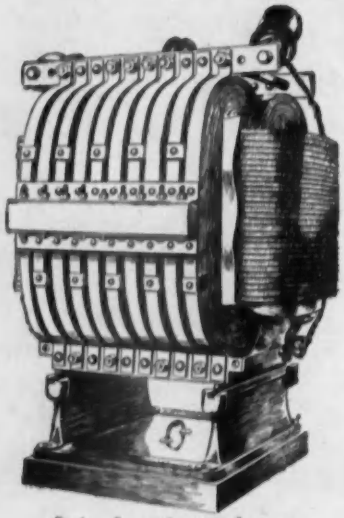

Early Ferranti transformer built in 1891 now in the Science Museum, S. Kensington

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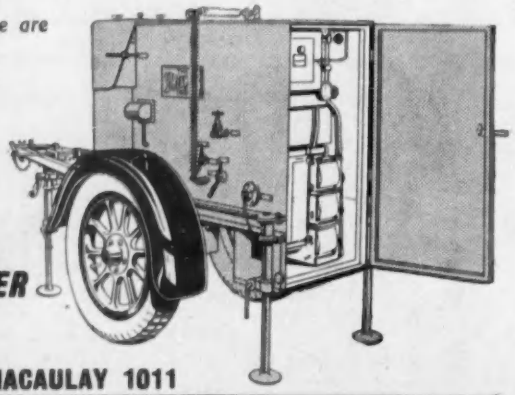

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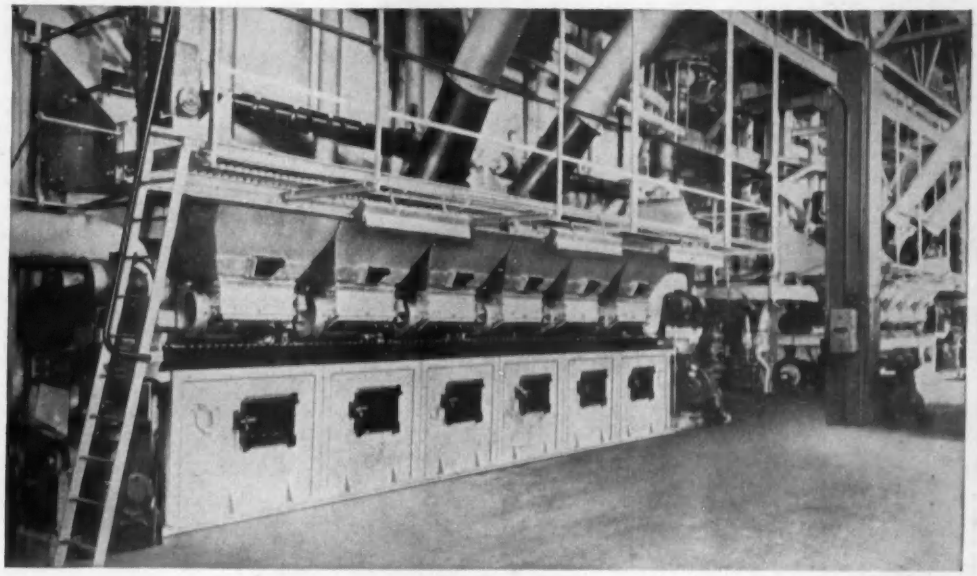

Babcock-Detroit spreader stokers firing Babcock Bi-drum boilers, each for 150,000 lb./hr. at 625 lb./sq. in., 865° F, at Osborne B power station, Adelaide (The Electricity Trust of South Australia).

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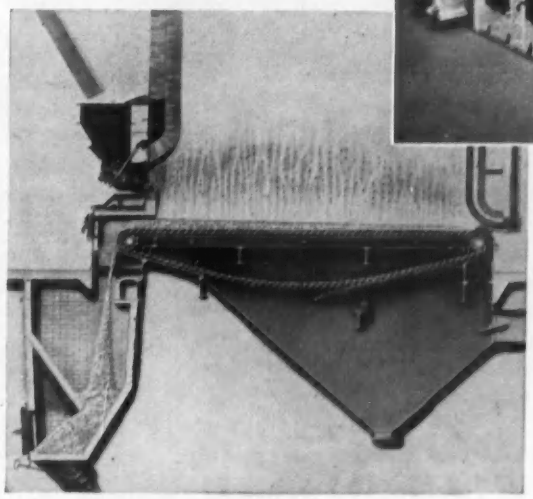
the most *versatile* and *flexible* form of stoker firing for water-tube boilers.

Versatile, because it burns efficiently an exceptionally wide range of low-grade and "difficult" fuels—e.g. fuels with low ash-fusion temperatures, or a high proportion of fines, and including waste-product fuels fired separately or in combination with coal.

Flexible in operation, because it tolerates wide changes in fuel quality without loss of efficiency and is *rapidly responsive to load changes.* Can be banked and brought up to full load with very low fuel consumption.

Flexible in application, as it is available in three types; with *fixed, dumping* or *forward-travelling grate*, to meet most effectively the stoker requirements of every installation from small industrial boilers to power station units, of capacities up to approximately 250,000 lb. steam/hr.



One of 2 Babcock-Detroit stokers firing Cross-type boilers, in the North boiler house of Guest, Keen & Nettlefolds (Midlands) Ltd.

FUEL is delivered to simply adjusted feeder units disposed across the furnace width. Each is equipped with an "overthrow" rotor, the curved blades of which project the fuel into the combustion chamber, where it is burned partly in suspension and partly on the grate, at an even rate of combustion over the whole grate area.

The grate surface and the insulating layer of ash between it and the combustion zone are cooled by the incoming air, so that the grate is maintained at a safe temperature and clinkering prevented, even with fuels having low ash-fusion temperatures. The illustration shows the operation of a Babcock-Detroit stoker with travelling grate.

Ask for these Publications:
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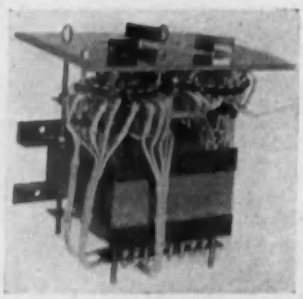

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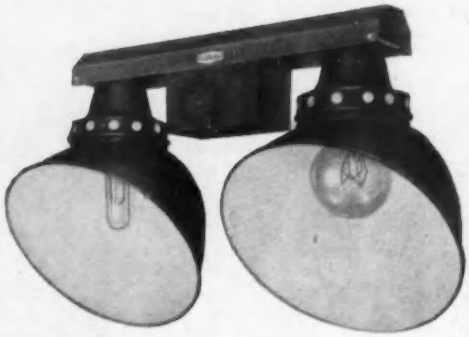
"Blendolite" fitting with circular vitreous enamelled reflectors.

"Blendolite" fitting with prismatic glass reflectors.

"Blendolite" fitting with parabolic angle vitreous enamelled reflectors.



"Blendolite" fittings have given trouble-free service even in the adverse conditions of temperature and humidity frequently encountered in heavy industry. Reflectors are vitreous enamelled, and accurately positioned vitreous enamelled baffle plates above the lamps direct the major part of the heat from the lamps through ventilating slots into free air. The construction of the chassis is such that the small amount of heat which passes the baffles is immediately dissipated. Correct lampholder and lampcap temperatures are, therefore, maintained throughout operation. The choke in its housing is suspended in cool free air and cannot become subject to over-heating. Trouble free operation is further ensured by the use of special wiring, and deterioration of the supply leads is avoided by mounting the terminal block in a cool position : a P.F.C. capacitor and fuses can be incorporated if required by the provision of a gear housing of greater depth.

"Blendolite" fittings can be fixed direct to the ceiling or trunking or suspended from chain or conduit. Either circular or parabolic angle vitreous enamelled reflectors are available and a modified version using prismatic glass reflectors can be supplied. Lamp wattages range from 300 watt tungsten and 250 watt mercury discharge to 1,000 watt tungsten with 400 watt mercury discharge sources.

Publication LE.1774 giving full details of "Blendolite" fittings may be obtained from any Ediswan Office and Ediswan Lighting Engineers will gladly co-operate with you in planning your lighting installation.

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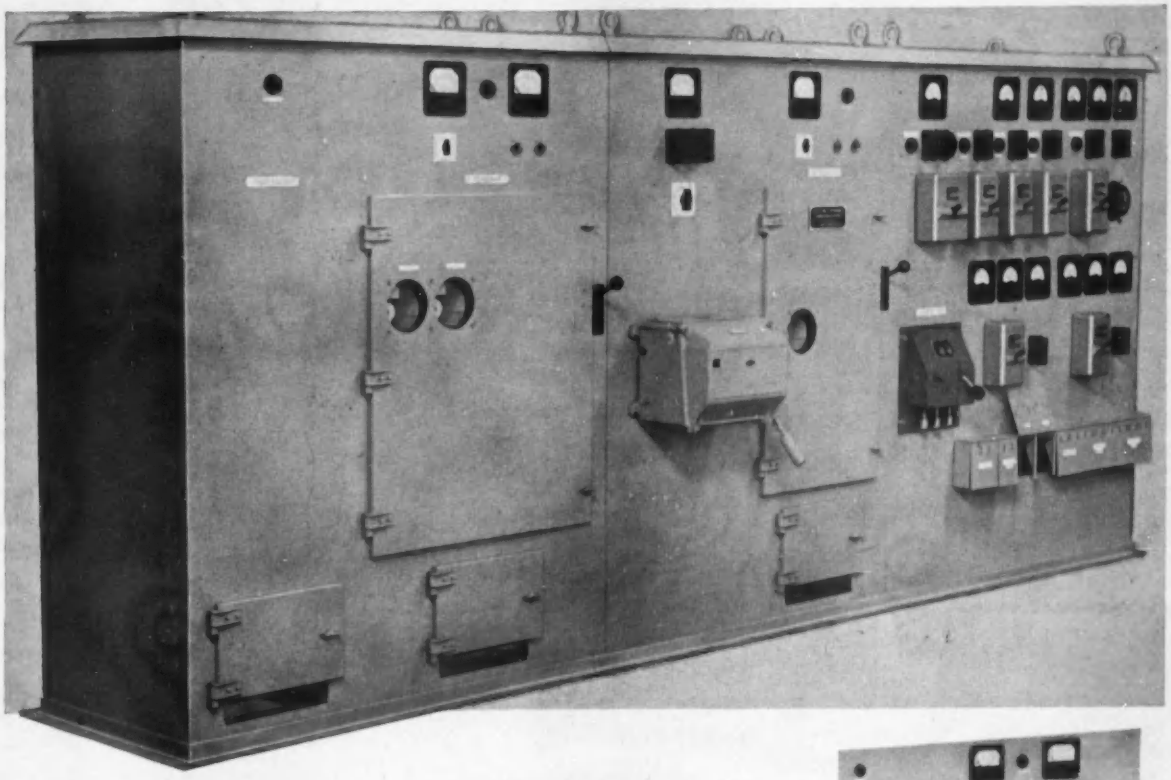

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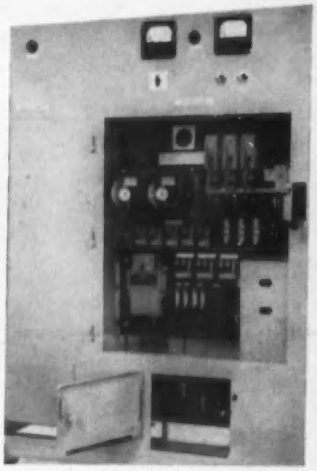

ABOVE: Part view of 20/60 H.P. section of panel, showing isolator; stator-contactor overload relay with range selector switch; earth leakage relays for HT and LT circuits and selector links. Terminals for Test leads under separate interlocked cover below.

COMPLETE Panel includes section for 3,300 volts 3-phase motors up to 100 H.P.; for motors of 20/60 H.P. 440 volts 3-phase; for motors up to 20 H.P. 440 volts; and one multi-circuit panel for various low power supplies.

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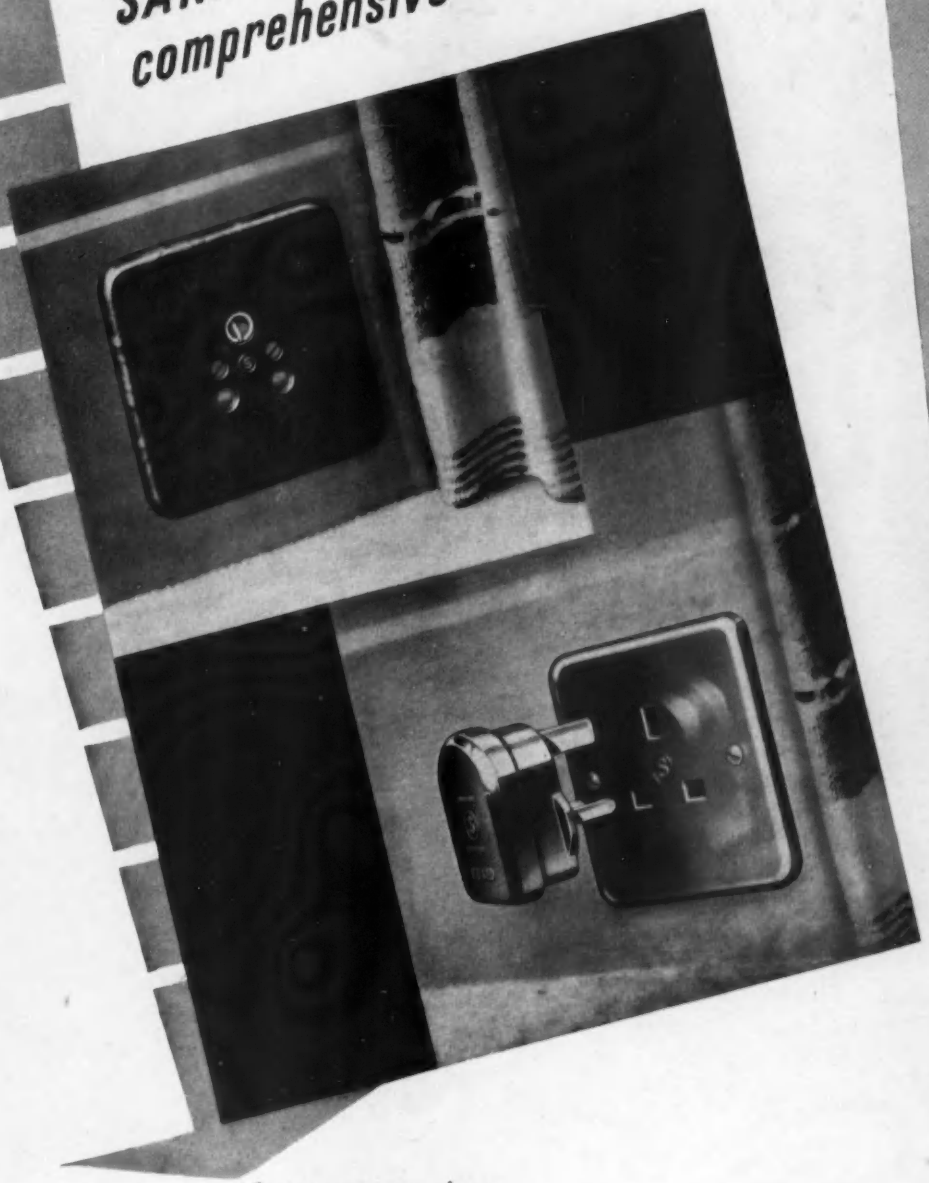

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WESTALITE RECTIFIERS TYPE 4

Next Smaller, see D.S. 405 Next Larger, see D.S. 403 **Data Sheet 404 1st Edition**

VOLTAGE RATINGS Per series element. Maximum peak reverse: 24·3 volts.
Ratings in various circuits with sinusoidal input.

Circuit	Load	Max. D.C. R.M.S. Input	Nominal Mean Output
Half-wave	Condenser	10 volts	10 volts
Voltage-doubler	Condenser	10 volts	20 volts
Phase bridge	Resistive	17·1 volts	12 volts
" "	Condenser	15 volts	15·2 volts
" "	Battery, AC	18·0 volts	12 volts
" "	ballast		
" "			12 volts

Inter Service Type Approval Certificate 479/4 (588/1) covering full approval for 55°C Category H.2 has been granted for type T4A rectifiers.

MOUNTING DETAILS
4A, B, C spindles horizontal, but not more than two horizontal layers.
4D may have spindle vertical.

PARALLEL PATHS
Economic limit 1 path of 4B, C, D but 1 or [illegible] Space limitations may [illegible] parallel paths. There

404

WESTALITE RECTIFIERS TYPE 14

Next Smaller, see D.S. 415 Next Larger, see D.S. 413 **Data Sheet 414 1st Edition**

VOLTAGE RATINGS: Per series element. Maximum peak reverse: 42 volts.
Ratings in various circuits with sinusoidal input.

Circuit	Load	Max. D.C. R.M.S. Input	Nominal Mean Output
Half wave	Condenser	15 volts	15 volts
Voltage doubler	Condenser	15 volts	28 volts
1 Phase bridge	Resistive	29·5 volts	22·5 volts
1 " "	Condenser	29·5 volts	30 volts
1 " "	Battery, AC	36 volts	24 volts
1 " "	res. ballast		
3 " "	Battery, DC	29·5 volts	24 volts
3 " "	res. ballast		
DC Stopper	Battery, choke	36 volts	22 volts
	ballast		
	Battery, choke	36 volts/line	28 volts
	ballast		
	Resistive	29·5 volts/line	34 volts
	Resistive	25 volts DC	

Inter Service Type Certificate 479/4 (588/1) covering full approval for 55°C Category H.2 has been granted for type T14A rectifiers.

MOUNTING DETAILS
14A, B, C spindles horizontal, but not more than two horizontal layers.
14D may have spindle vertical.

PARALLEL PATHS
Economic limit 1 path of 14D, C or B but 1 or 2 parallel paths of 14A. Space limitations may necessitate using more parallel paths. There is no restriction.

CURRENT RATINGS: Per parallel path (milliamperes mean)

Type	Non-preferred type 14D				Non-preferred type 14C				Non-preferred type 14B				Preferred type 14A			
Ambient °C. average	25	35	45	55	25	35	45	55	25	35	45	55	25	35	45	55
maximum	35	45	55	55	35	45	55	55	45	55	55	55	45	55	55	55
Half-wave: Voltage-doubler	25	20	15	—	35	25	20	10	65	50	35	20	90	65	45	25
Single-phase bridge: resistive load	110	85	45	—	140	110	70	15	240	200	140	75	300	240	185	100
Single-phase bridge: battery choke ballast	50	35	25	—	65	50	35	20	130	90	65	35	180	120	85	45
Single-phase bridge: condenser ballast	88	68	36	—	112	88	56	12	190	160	112	60	240	190	150	80
Three-phase bridge, resistive or battery load	160	120	65	—	200	150	100	20	330	280	210	100	400	330	250	140
DC Stopper	100	80	60	35	125	100	80	50	210	175	130	80	276	210	160	100

DIMENSIONS and WEIGHTS. (Approximate)
Cat. No. appears on the positive end, except when both ends are negative. Spindle No. 2BA projecting ¼" (8 mm) each end
Effective area of element = 2·21 sq. cms.

	14D	14C	14B	14A
Overall size	¼" (20 mm) Dia.	1¼" (28 mm) Dia.	1¾" (45 mm) Sq.	2¼" (57 mm) Sq.
Maximum number of elements	90	90 (Inc. dummies)	90 (Inc. dummies)	90 (Inc. dummies)
In the following formulae N = Total number of discs used, i.e., elements + dummies.				
Length (ins.)	1 + 0·072N	1 + 0·076N	1 + 0·076N	1 + 0·076N
(mm)	25·3 + 1·82N	25·3 + 1·91N	25·3 + 1·91N	25·3 + 1·91N
Weight (ozs.)	0·33 + 0·146N	0·94 + 0·161N	0·8 + 0·26N	0·8 + 1·0N
(grms.)	9·2 + 4N	28 + 4·55N	23 + 7·2N	23 + 28·3N

TESTS Flash Test 2,000 volts AC R.M.S. to spindle.
Forward Pass 260 mA DC. Voltage drop not to exceed 1·63 volts.
Reverse Apply 25 volts smooth DC per series element for four or more series elements seconds may be double the above.

WESTINGHOUSE BRAKE & SIGNAL Co.

Type 14D

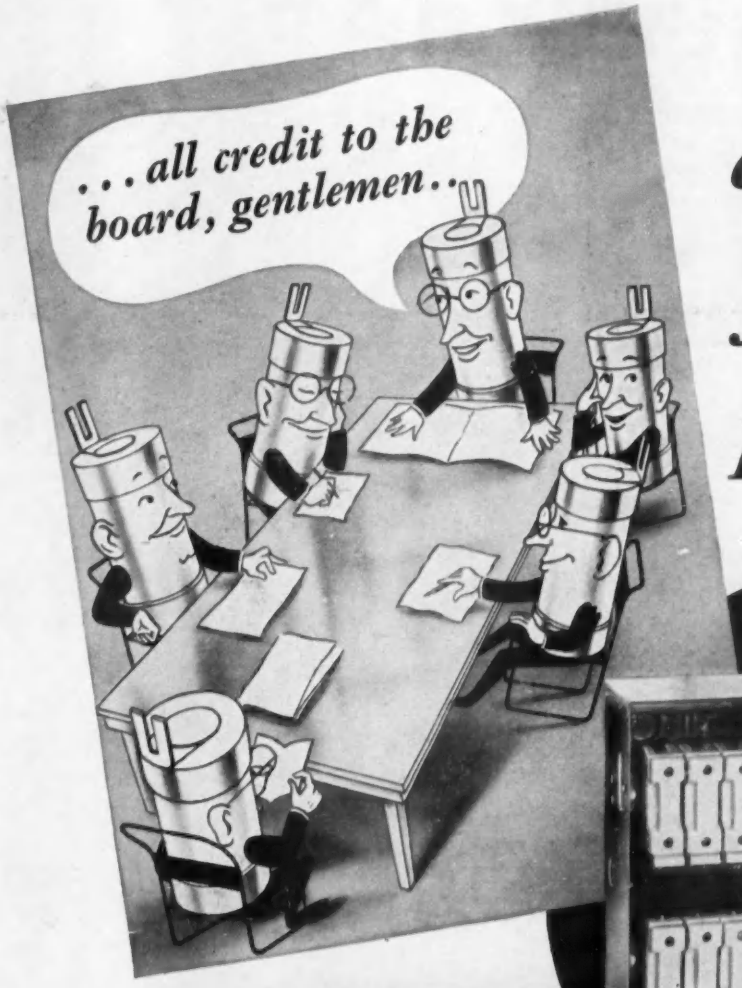
Type 14C

Type 14B

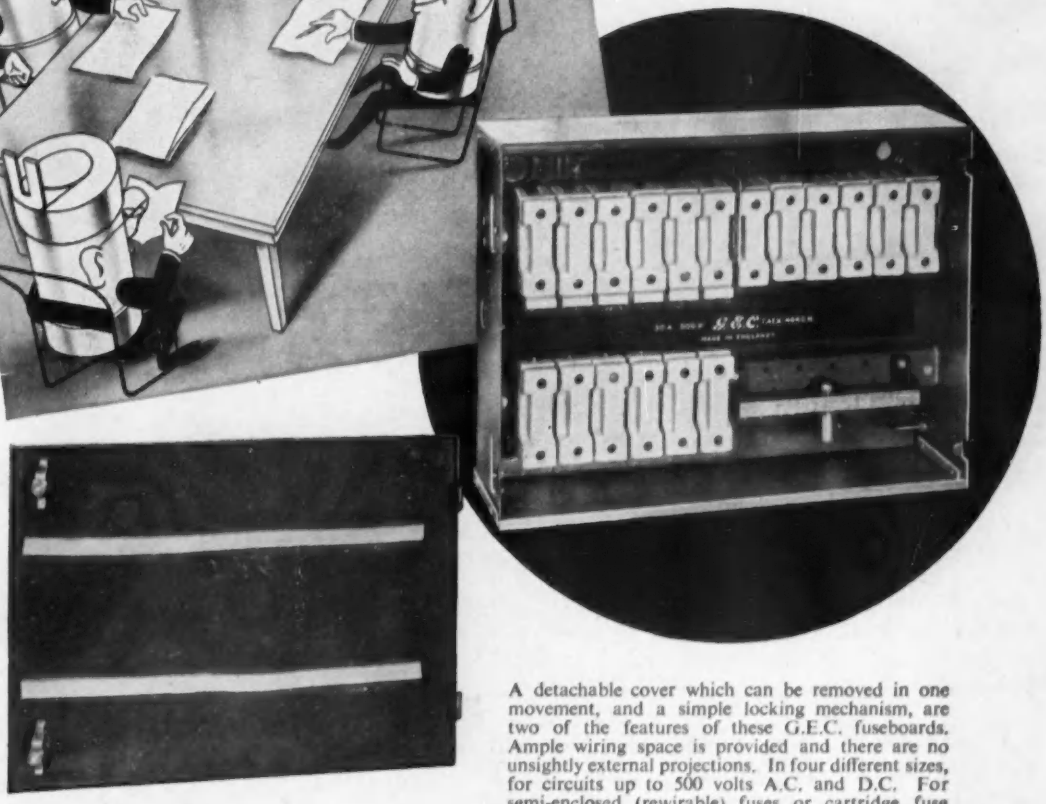
Type 14A

FIG. 1.

414



efficient fuseboard planning



A detachable cover which can be removed in one movement, and a simple locking mechanism, are two of the features of these G.E.C. fuseboards. Ample wiring space is provided and there are no unsightly external projections. In four different sizes, for circuits up to 500 volts A.C. and D.C. For semi-enclosed (rewirable) fuses or cartridge fuse links (H.R.C.) type. Switchgear bulletin X2732 will give full details, why not send for your copy?

G.E.C.

20, 30, 60 & 100 AMP.

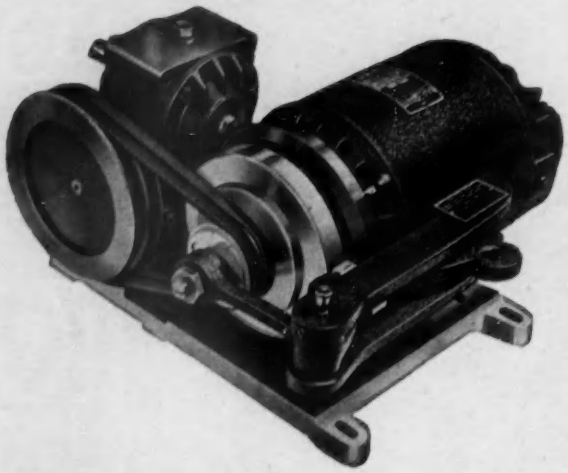
FUSEBOARDS

IN PRESSED STEEL CASES

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

MARDRIVE REG'D

CLUTCH WORM REDUCTION UNIT



The Mardrive clutch worm reduction unit is invaluable for low speed drives where it is necessary to start and stop instantly and at more frequent intervals than is possible by direct switching of the motor.

The unit has simple, adjustable, belt tension between the unit and the driven member.

By the use of varying ratios of worm reducers a speed range of from 10 r.p.m. to 115 r.p.m. is readily attainable and with variations of the pulley sizes, this range can be further increased.

These fractional horse-power units are readily available for use on single-phase, three-phase or D.C. electrical supply.

The unique qualities of the MARDRIVE clutch worm reduction unit make for elimination of fatigue and an increase in both quality and quantity of production.

The MARINE ENGINEERING COMPANY (STOCKPORT) Ltd
BULKELEY STREET EDGELEY STOCKPORT

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OF EVERY

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FOR THE ELECTRIC WIRE AND CABLE TRADE

Makers of all kinds of wood and steel reels for the electric wire and cable trades.
Our speciality:-Steel flanges with very strongly beaded edges in a wide range of diameters, and friction rings made wholly from mild steel.

REELS LIMITED

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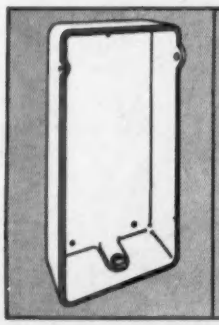
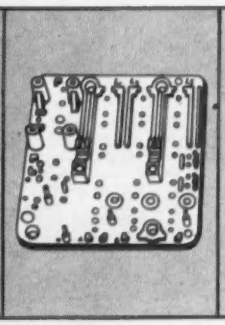
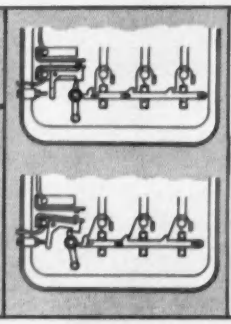
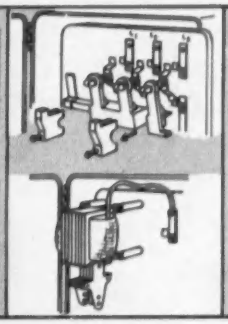
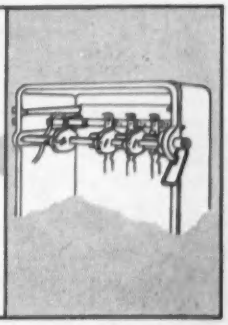
FACTS ABOUT CONTROL GEAR

STAR-DELTA
SWITCHING STARTER
Max. H.P. 12½

BROOK MOTORS Ltd

LOW IN COST
STRONGLY BUILT
GIVES FULL PROTECTION
LOW VOLTAGE RELEASE

DIE-CAST CASE	PLASTIC PANEL	THERMAL OVERLOADS	CONTACTS & COILS	BUILT-IN ISOLATOR
				
Totally Enclosed diecast case suitable for wall mounting.	Moulded plastic panel keeps parts to the minimum and makes maintenance easy.	External hand-reset. Heater coils interchangeable for different h.p. ratings.	Easily renewable. Coils pressure impregnated and baked.	Mechanically interlocked with cover to ensure that starter is not live when opened.

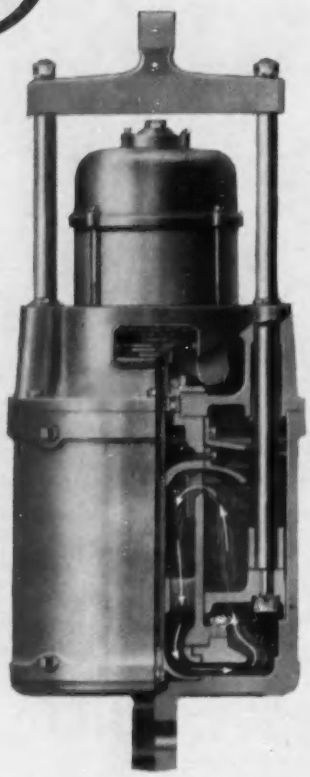
BROOK MOTORS LIMITED
HUDDERSFIELD

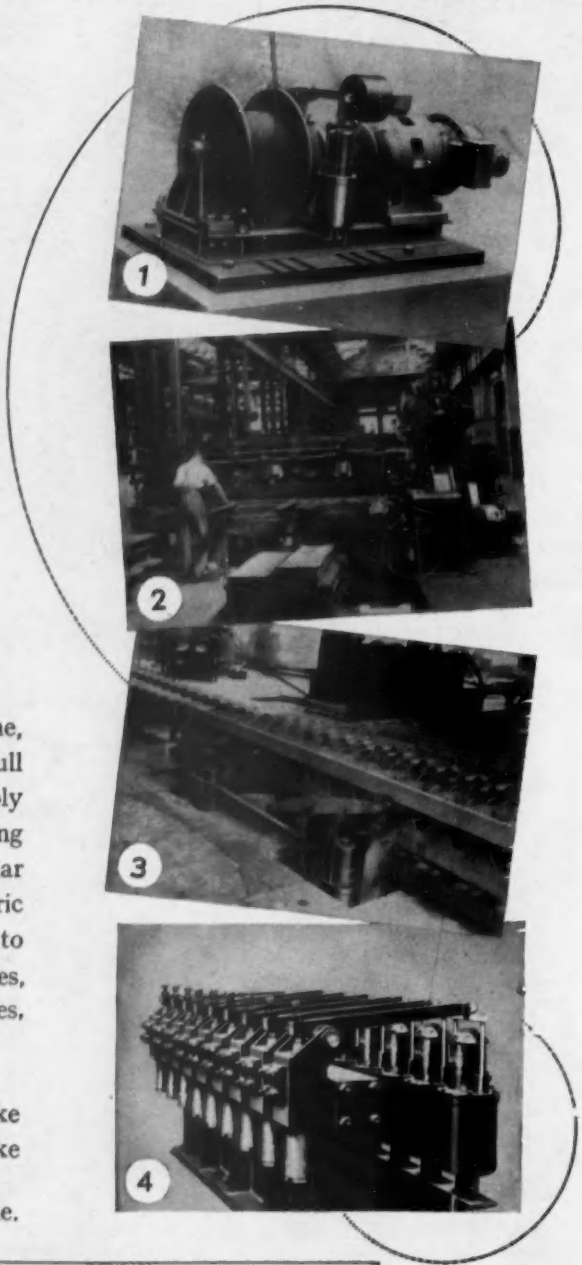
55/3

B T-H

ELECTRO-HYDRAULIC THRUSTORS

Just switch on—
the thrustor does the work!





Designed to exert a smooth straight-line, constant-pressure thrust throughout full stroke without shock or jar. Admirably suited to applying pressure, actuating lever mechanisms, or replacing muscular effort through the medium of electric control on any mechanism it is desired to operate. Applications include, (1) brakes, (2) clutches, (3) conveyors, (4) valves, doors, guillotines, presses, etc.

From 40 lb. thrust up to 2 in. stroke
To 800 lb. thrust up to 12 in. stroke

Flameproof Thrustors are available.

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BRITISH THOMSON-HOUSTON
COMPANY LIMITED, RUGBY, ENGLAND

Member of the AEI group of companies

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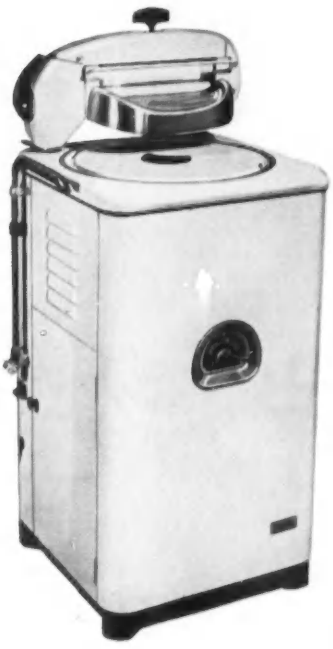

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WHG/P30

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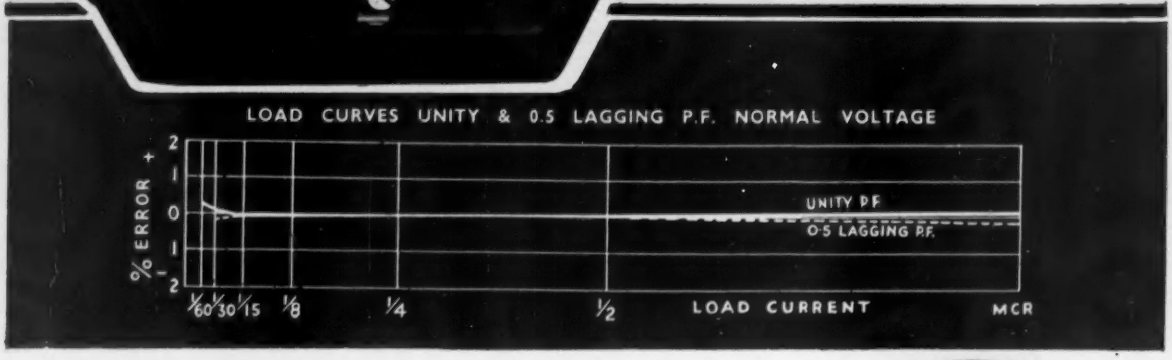
THE TM3 METER



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